An Argus Specialist Publication
AUGUST 1985
90p

Your COMMODORE

YOUR BEST INDEPENDENT COMMODORE MAGAZINE

MESSAGE........
THE MONTH
WE MAKE
CONTACT STOP



Modems – Close encounters with your 64

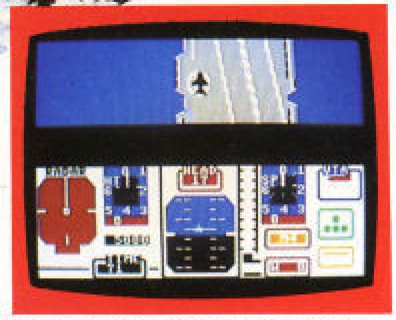
S-t-t-t-t-r-r-r-r-etch! BASIC on the rack

Micro education – a class above the rest

fab competition
WIN, & MEET PAUL McCARTNEY



Every pilot has the dream of flying one of these unique and complex fighting machines. Here is your chance to do what few pilots have the privilege to try.



Written by
Vaughan Dow
Jump Jet Pilot

Depending on your skill, confidence and courage, you have the choice of remaining near the landing pad, learning to hover and land, or venturing higher to practise your approaches.
When you think you have mastered these, then accelerate the Jump Jet into an attack fighter. Use the radar and range finder to seek and destroy the enemy, by launching heat-seeking air-to-air missiles. Beware! His radar and missile systems are as good as yours. Reckless pursuit is ill-advised: you must maintain a fuel level that will enable you to relocate and return to the aircraft carrier, executing the skills you have learned to achieve a successful landing.
You are now ready to proceed to the next skill level to face additional hazards, such as unpredictable swell and treacherous cross-winds.
Be warned, this program is not a toy or game. You will need to co-ordinate your hands, eyes and mind to successfully complete each mission. Do not hope to achieve in a short time that which took the author three years to learn as a Jump Jet pilot, and over a year to record on this computer program.



ANIROG

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Our COMMENT

IT'S NINE O'CLOCK IN THE MORNING. Our famous hero Adenoid Anthony is rising from bed for a day at school.

Anthony descends the stairs and walks over to his Commodore C999, switches it on and dials up his local education centre ready for the days lessons.

You may think that all of this seems a little far fetched. Well it isn't. It is already possible for you to link your computer to numerous other systems around the country by means of a device called a modem. Quite simply a modem takes information from one computer, transfers it into a form which can be sent down a telephone line and a modem at the other end of the call transfers this back into a form that the other computer can understand.

The 'other computer' could be one that is owned by a friend and you could be sending your latest programs to one another or it could possibly be one of the large commercial systems such as Prestel or Compunet. Prestel is used within many companies for gathering information. You must have seen Prestel terminals in travel agents used for keeping them up to date with variable holidays. Compunet is a system run specifically for Commodore owners and offers news, games and an area called the Jungle where subscribers to the system can set up their own area and store their own programs.

So you see, Adenoids' 'school in the home computer' is not really all that far away, you can already get access to a large amount of information over your telephone line.

In order to help you to enter this new area of computing we have a couple of features in this issue dedicated to communications on your Commodore computer.

The first article explains just what is available once you have forked out the money for a modem for your computer. There is even a list of bulletin board telephone numbers that will allow you to access computers all over Great Britain.

The second article gives details about some of the modems that are currently available for Commodore micros and explains the differences between the cheaper and dearer modems.

Why not join Adenoid Anthony by becoming a part of this exciting new area?

Introductions

Now it's time for the boring bit where I get a chance to introduce myself.

You may have noticed that there has been a few changes to the list of staff working on the magazine. Alison Hjul has unfortunately moved on to new pastures and I have taken over as Editor of the magazine.

Even though I am sat here at Your Commodore HQ, I feel that this is not my magazine but rather, as is stated in the title, it is yours, the readers. In order for me to continue seeing the magazine in this way I must rely on all you Commodore owners sat at home, programming your machines and making new discoveries, to write to me here at Your Commodore, sending in that fantastic new game that you know everyone will love to play or that great new utility that will turn your computer into the best thing since the creation of Commodore Business Machines.

So there you have it, get stuck into the magazine, have fun and don't forget I'm waiting to hear from you.





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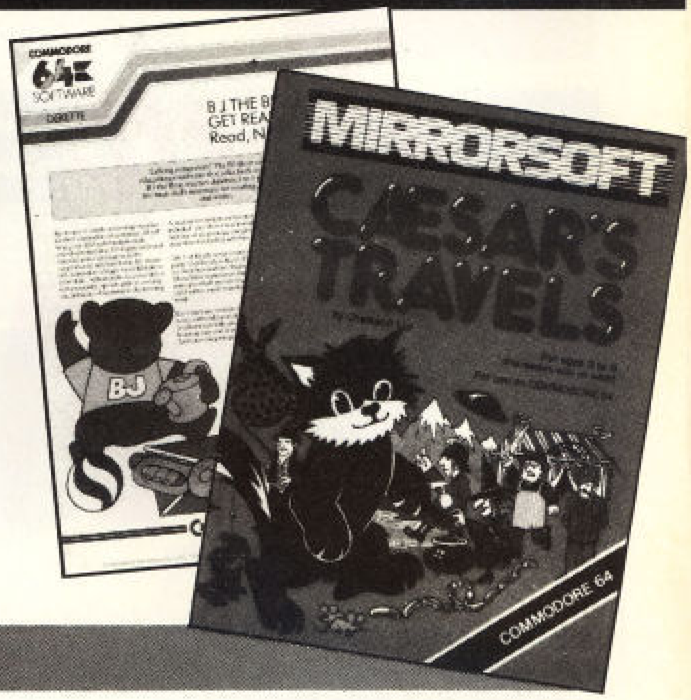
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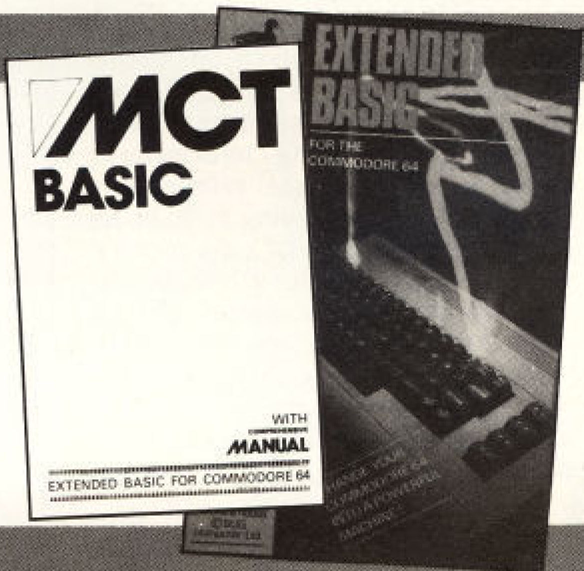
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FEATURES









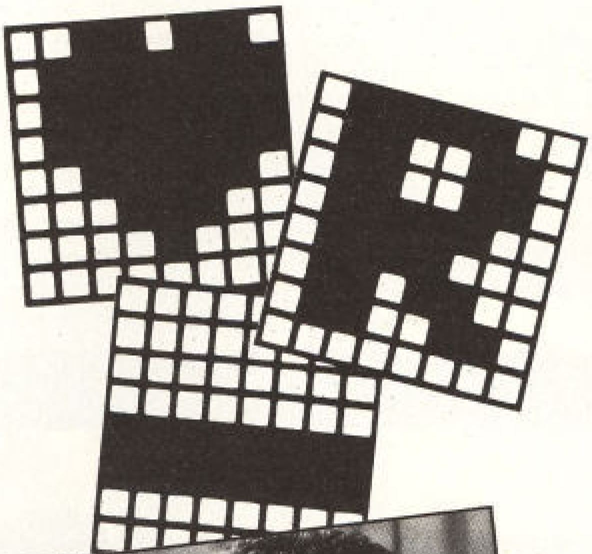
CONTENTS

COMPETITION

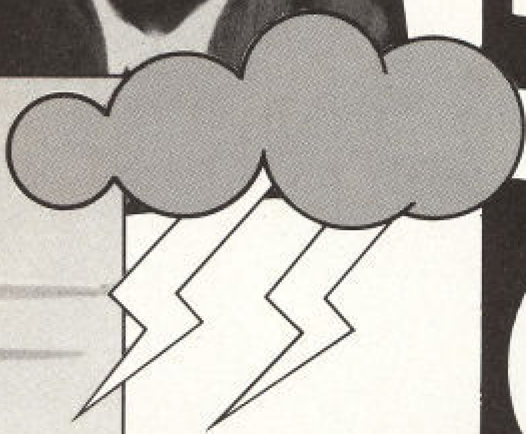
SERIES

GAMES AND UTILITIES

REGULARS









DATA STATEMENTS

Public see the 128

The British public had its first glimpse of Commodore latest computer at the Sixth International Commodore Computer Show. The Commodore 128 was on show together with a full range of new peripherals, including a new disk drive, the 1571 which will load programs much faster than the existing 1541. The 1571 is seen as a replacement for the 1541 as it is completely compatible with the Commodore 64, although the disk drive will not work any faster than the present 1541 on this machine.

No prices were announced for the new hardware and it was also stated that there will be no price cuts made to the Commodore 64. In order to promote the '64 Commodore has announced a number of value added packs. The first of these is a '64, cassette recorder and a copy of International Soccer for £199. Sales of the new Commodore package will be further promoted by a special holiday offer that will give anyone purchasing a Commodore 64 or Commodore 16 three nights' free accommodation for two people at a choice of 300 hotels throughout Britain and the Continent.

As well as promoting the sales of the '64, special peripheral value packs were announced, for £229 it will be possible to purchase a 1541 disk drive with the Commodore Modem and a selection of disc based software. This is a saving of over £200.

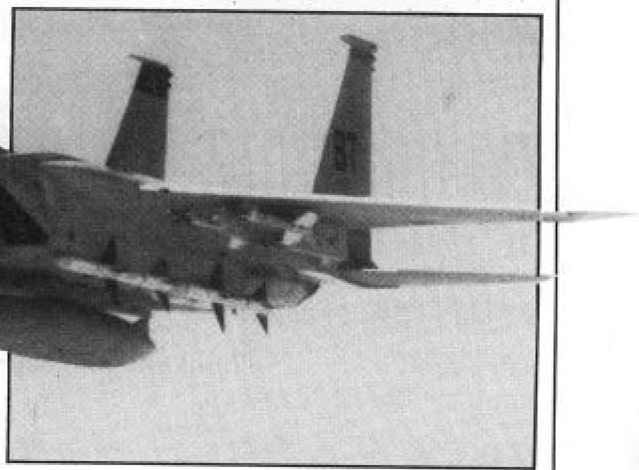
A business pack is being offered, based around a Plus/4, for £449. The pack comprises of a Plus/4, a 1541 disc drive and an MPS 801 dot matrix printer. A suite of business programs, called Impex 1,2,3, is also included in the price. This pack has an overall saving of £198.

Probably the most exciting item to be previewed at the show from was a sound sampling device from Music Sales, the company who produce the Commodore music keyboard. The device will allow you to sample any sound, for example a human voice, and then alter it using the computer. You could alter the pitch of the speech so that it was either higher or lower than your own, you could even play a tune on the word hello if you really wanted. The sampler is expected to be ready for launch by christmas and will cost around £70.

Software houses launched a number of new titles at the show. Melbourne House showed Exploding Fist based around the karate games that are in the arcades. Domark showed A View To A Kill, based around the James Bond Film of the same name, and Island Logic were showing their Music System a program which received much publicity on the BBC.

Fly to the USA



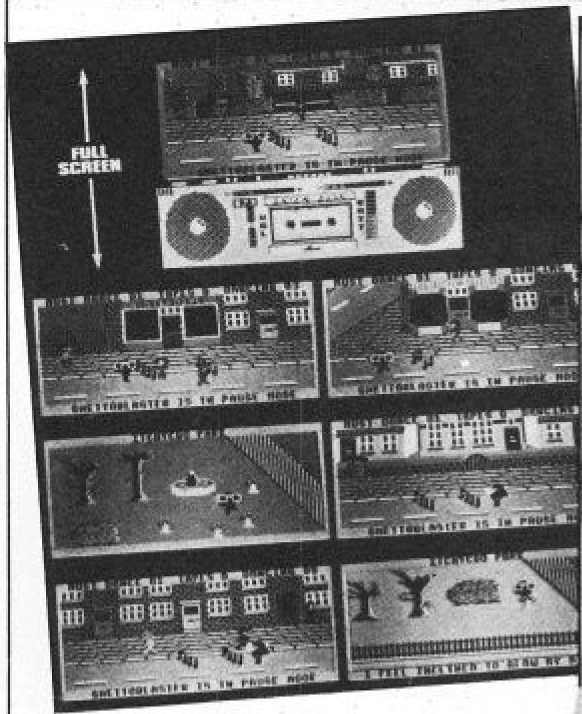


IT IS THE NORM FOR AMERICAN SOFTware to be bought by British companies and launched in this country, one only has to look at the giant US Gold to prove that this works.

It is however extremely unusual to hear of a British software product to be bought by an american company for sale in the States. However, this is just what has happened to Digital Integration and its game Fighter Pilot.

Digital Integration has finalised a deal with the US giant EPYX that will allow EPYX to manufacture and market the 64 version of the game throughout the US and Canada. The name of the program will be changed to Jet Flight Simulator.

Gibbo Jams for Virgin





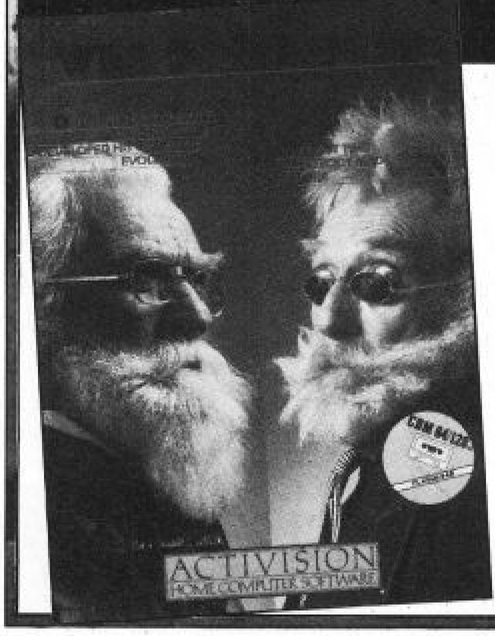
TONY 'GIBBO' GIBSON THE AUTHOR of the Taskset games Jammin, Bozo's Night Out and Seaside special has quit the Bridlington based company and licensed his latest game to Virgin.

The new game, Ghettoblaster was produced by Gibbo and his partner Mark Harrison. Both of them are very big music fans, as reflected in earlier games, and have produced what can only be described as a Musical Arcade Adventure. In fact there is so much music in the game that a special synthesiser was designed for them to work on.

In the game you play the part of Rockin' Rodney, last seen on a flashing spot somewhere in the game Jammin, as a messenger for Interdisc Records. Rodney must run around Funky Town collecting demo tapes which are for possible release. For some unknown reason Rodney also has the task of making the locals dance.

The game contains 12 original pieces of music and the graphics are extremely reminiscent of Gibbos Taskset games.

What Next?



Q. When is a game not a game?
A. When it's called Web Runner the latest program from the Activision stable.

Web Runner is described as a musical fantasy of light, colour and sound. The aim of the game(?) is to traverse a web pattern and freeze a number of objects that are moving around it. The difficulty in deciding whether or not it is a game stems from the fact that there are no lives and no points scored. Whatever next? Computer games without a computer?

Web runner should be available in your local computer store and will cost £10.99.

U.S. Gold go to Disneyland

U.S. Gold, Ocean and Walt Disney Productions have finalised a deal that will give the British companies a licence to create computer programs for the forthcoming Walt Disney films Return to Oz, the sequel to the Wizard of Oz, and The Black Cauldron, a film which Disney are expected to spend around £750,000 on the advertising alone. As well as producing games for the new films, U.S. Gold and Ocean have been commissioned to produce a game based around that old favourite the Jungle Book.

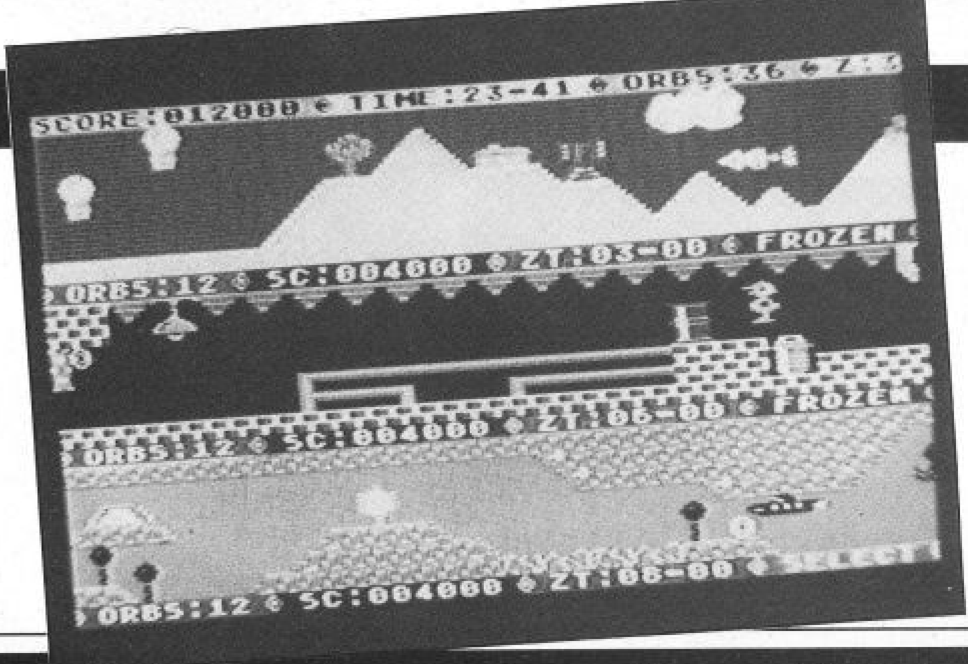
It would also appear that U.S. Gold is being allowed to use many of the other popular characters from Disney films including Mickey Mouse, Donald Duck, and Winnie the Pooh.

In addition to the agreement that will allow U.S. Gold to use these World famous characters, U.S. Gold will also have the rights to the current range of Walt Disney titles. The first three to be released are:

'Mickeys Space Adventure' which is described as an adventure game through our solar system for ages of 8 years upwards. 'Winnie the Pooh in the Hundred Acre Wood' another adventure for children aged 7 years and up and 'Donald Duck's Playground' which aims to teach the skills of matching items, making money and change making.

These products are marketed in the U.S. by Sierra On-Line and U.S. Gold hope to have them available on the market by Christmas 1985.

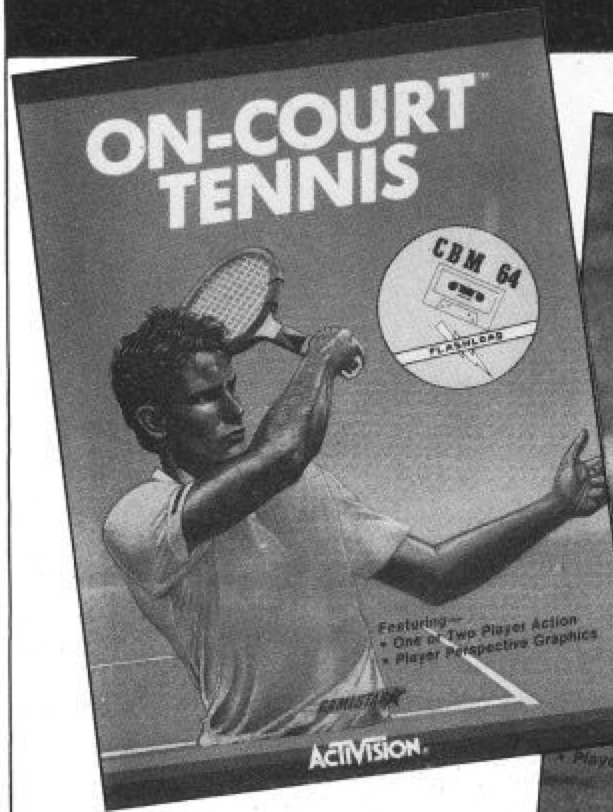
A timeslip for English Software

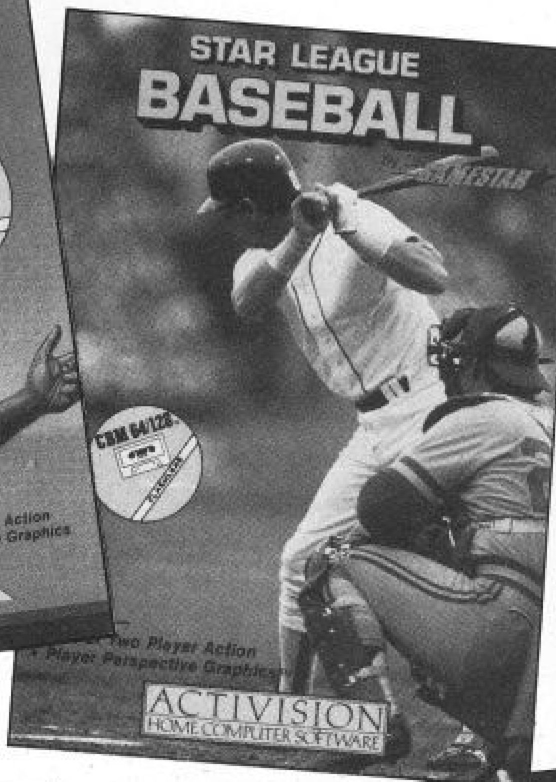


ENGLISH SOFTWARE A COMPANY THAT became established by producing software for the old Atari computers has just launched its first game for the Commodore C16/Plus 4. The game, called Timeslip, features what English software claim unique game design, whatever that may be and, 3 way split screen scrolling action for one player.

Each of the split-screen sections is 15 screens wide, all of them different, and all fitting into just 16K. Timeslip will cost £6.95

Summer Madness





You can definately tell that it is summer just by looking at the latest games available from Activision. All three of them are computer simulations of sports.

On-court tennis will keep all you Wimbledon fans happy. You can choose from four players, all supposedly patterned from real life tennis players, and the type of court that you wish to play on. I just hope we don't have any displays of bad behaviour from the stars.

Star league baseball brings the excitement of this american game into your living room. Options to play against another human player or the very tough computer player should keep all the family happy.

Fans of the American version of football are catered for with On-field football. This game allows you to play this extremely violent sport within the safety of yor own home.

Superman visits Great Britain

MONOLITH-TIMELESS SOFTWARE WILL be launching a new adventure game based around that well loved superhero Superman.

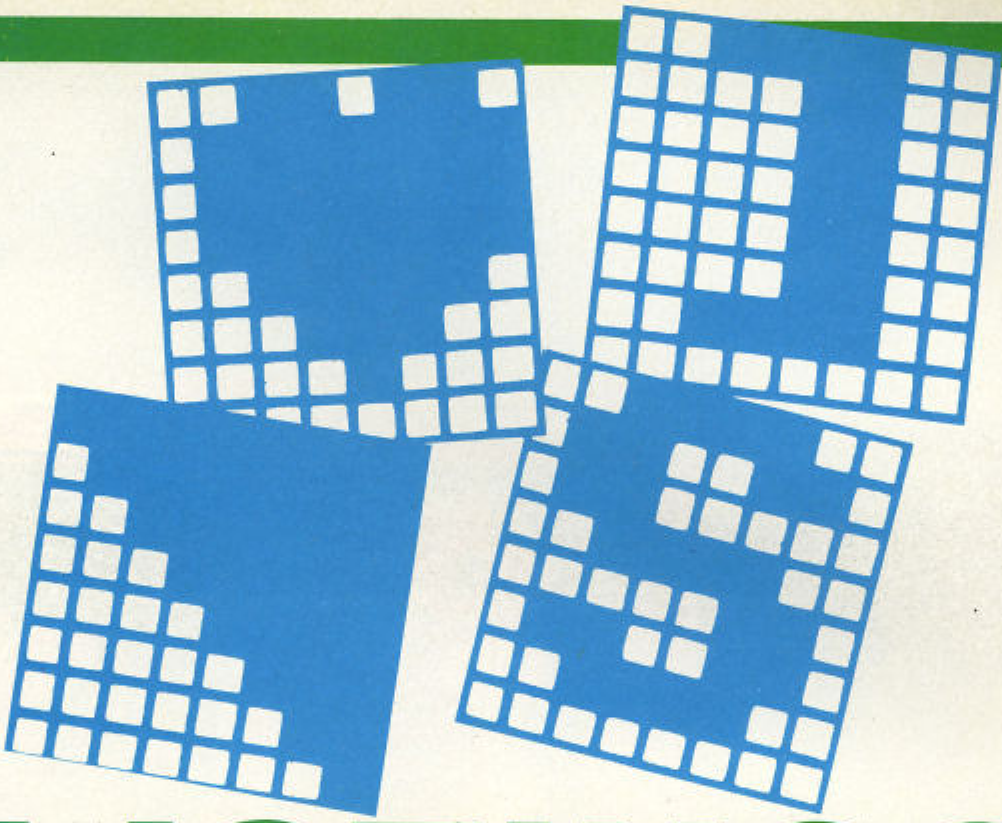
The adventure game is being produced in close association with America's First Star who are part of the Warner Communications Group.

What Monolith Timeless software claim to be a unique concept called 'authoring' has been used in writing the game. This system allows the games and graphics designers to create superb animated cartoon graphics.

Monolith are due to launch their debut titles.

Monolith's first titles should just be appearing on the market these are Rockford's Riot and Quake Minus One.





LISTINGS

Listings will be much easier to enter with our new system.

COMMODORE LISTINGS ARE RATHER well known for the horrible little black blobs that always abound. Unfortunately the graphics characters which are used to represent graphic and control characters do not reproduce very well and they are also difficult to find on the Commodore keyboard.

For this reason Your Commodore started to precede any control characters with a REM statement on the previous line that explained exactly what the black blobs were meant to be. Unfortunately the graphics characters were not documented and these still cause some confusion. For this reason we are starting to use a new method for marking the control and graphic characters in our listings.

In future all control and graphics commands will be replaced by mnemonic within square brackets. This mnemonic is not typed out as printed in the magazine but rather the corresponding key or keys on the keyboard are pressed. For example [RIGHT] means press the cursor right key, you do not type in [RIGHT]. All of the keywords, what keys to press and how they are shown on the screen are shown below.

Any character that is accessed by pressing shift and letter will be printed as [s LETTER]

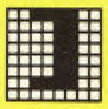
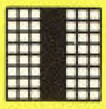
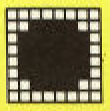
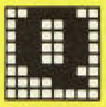
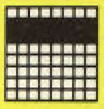
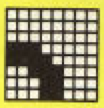
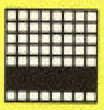
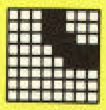
[s A]	shift and A
[s C]	shift & C

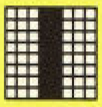
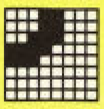
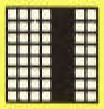
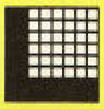
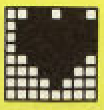
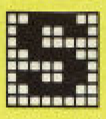
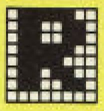
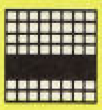
Any character that is accessed by pressing the Commodore key and a letter will be printed as [c LETTER]

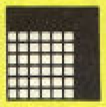
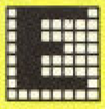
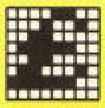
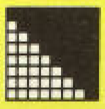
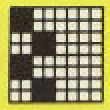
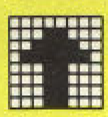
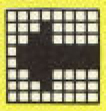
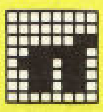
[c A]	Commodore & A
[c C]	Commodore & C
[c 1]	Commodore & 1

Any control key will be printed out as a number. For example [001]. Control codes are accessed by pressing the CTRL and a letter at the same time [001] is CTRL & A, 002 is CTRL & B etc. See the manual for more information about control codes.

[001]	CTRL & A
[026]	CTRL & Z

Mnemonic	Symbol	what to press
[RIGHT]		left/right
[LEFT]		shift left/right
[UP]		Shift & up /down
[DOWN]		up/down
[F1]		f1
[F2]		shift & f1
[F3]		f3
[F4]		shift & f3

Mnemonic	Symbol	what to press
[F5]		f5
[F6]		shift & f5
[F7]		f7
[F8]		shift & f7
[CLEAR]		shift & CLR /HOME
[HOME]		CLR/HOME
[RVSON]		CTRL & 9
[RVSOFF]		CTRL & 0

Mnemonic	Symbol	what to press
[BLACK]		CTRL & 1
[WHITE]		CTRL & 2
[RED]		CTRL & 3
[CYAN]		CTRL & 4
[PURPLE]		CTRL & 5
[GREEN]		CTRL & 6
[BLUE]		CTRL & 7
[YELLOW]		CTRL & 8

Don't Buy another tape or disk...

. . . . . Until you've seen the low, low prices in our Price List. How does **Spy Hunter** look at £6.45, or **Lords of Midnight** at £6.95? We're the cheapest for **Megahits** at £14.95 while **Blagger goes to Hollywood** is a mere £5.95. Need we go on? There are another 200 products we could tell you about!

So what's the catch, we hear you say? How many tapes must I commit to buy in a year? The answer is **none**. Once you've joined our Club, for a subscription of £3, you need buy nothing!

But wait. There's more to this Club than just the £'s you'll save on software. As a member you'll receive a bi-monthly (for the benefit of ignorant non-Commodore owners that means every two months) magazine, packed with in-depth reviews (including lots of screen photos), competitions to enter, game-playing tips and lots, lots more.

Hurry now. If you apply for membership within four weeks we'll give you a £1 voucher towards your first purchase. So send off the coupon now and we'll send you our most recent magazine by return. And if you're not absolutely delighted we'll give you your money back!



Mr. Software

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(*£5 applies to UK & BFPO only. Other rates are £7 Europe, £9 USA & Middle East, £12 Australia, Far East & S. Africa.)

PROGRAMMING PROJECTS

In this month's project, Garry Marshall shows how to develop a drawing package, complete with a Fill routine.

THERE ARE MANY TIMES WHEN YOU will need to develop illustrations for use within a program. It could be a technical picture for a design package or the backdrop for your latest game. This month we will develop a program that will make this extremely easy for you.

It is possible to draw any shape by linking a number of points together with lines. A program is to be developed that uses a cursor to indicate the points that must be joined to create a shape. This allows a 'free hand' drawing to be made but, for those with no special artistic ability, it can be employed by using the cursor to 'trace' an illustration held against the screen.

By adding the capability to fill a region with colour, the program can then be used to 'paint' a picture, providing a most satisfying utility.

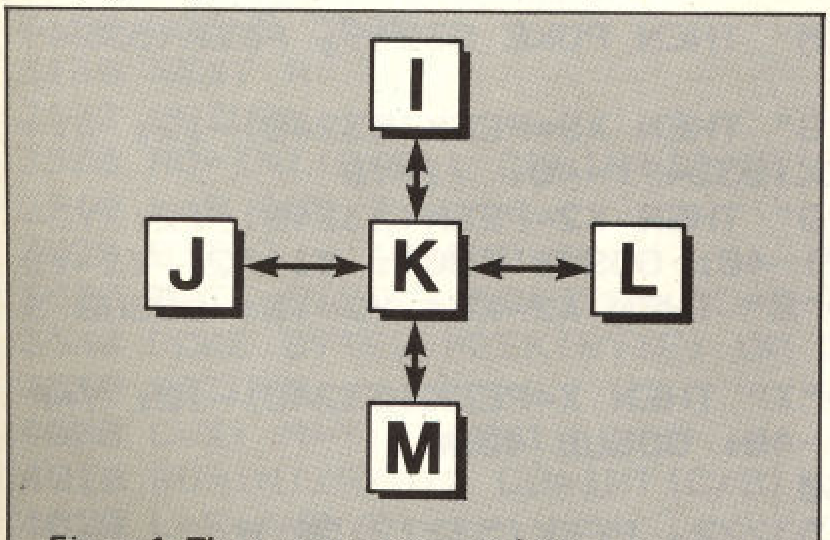


Figure 1. The cursor movement keys

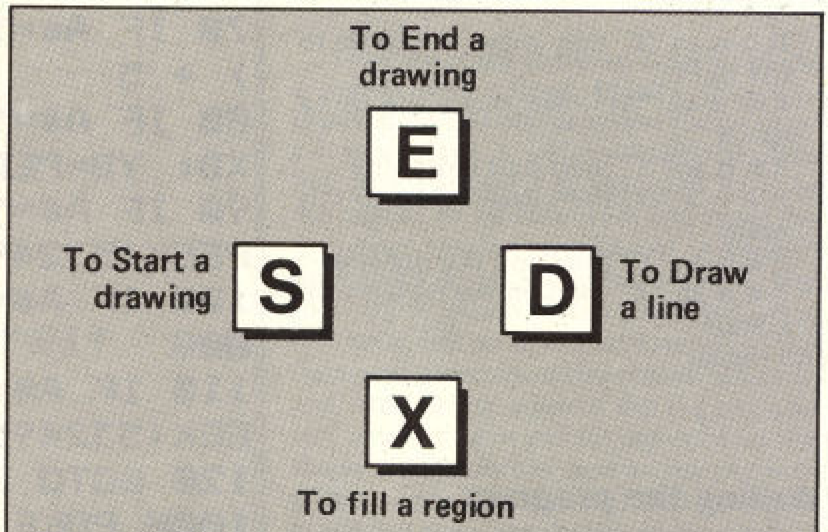


Figure 2. The keys for drawing and colouring

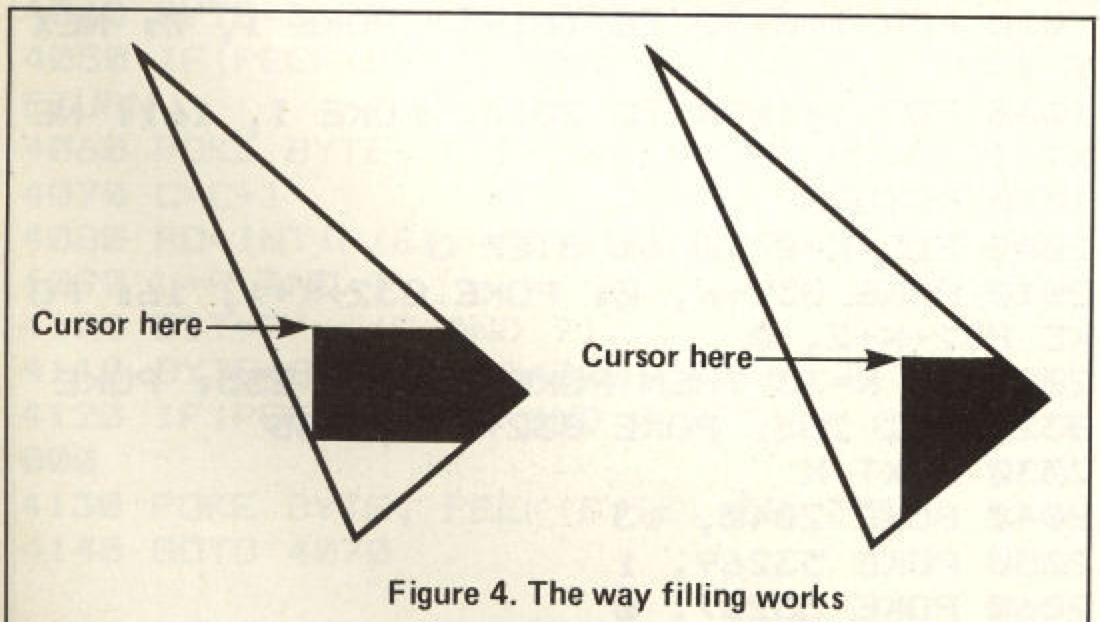


Figure 4. The way filling works

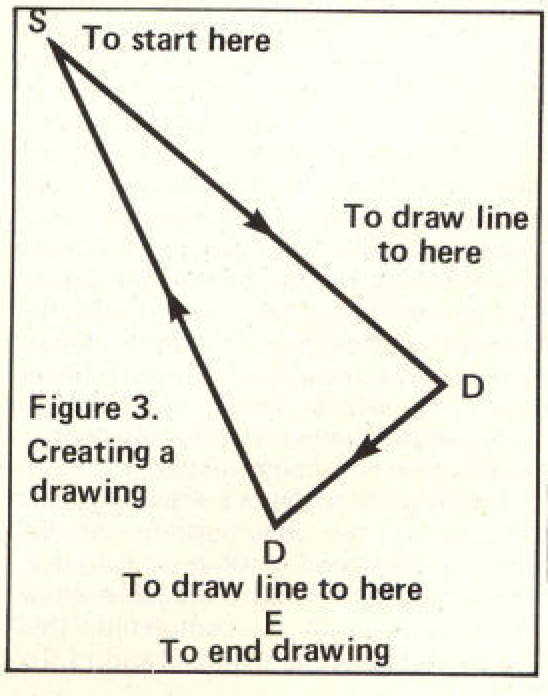


Figure 3. Creating a drawing

Starting out

Our program must begin by setting up the high-resolution graphics screen. A sprite is then created for use as the cursor, and placed on the screen. A cross-shaped cursor will give an accurate way of fixing the position of a point.

When this has been done, we can drive the program with single key presses from the keyboard. One group of keys can be used to move the cursor, and another for creating and colouring drawings. The four keys positioned in a diamond around the 'K' at the right of the keyboard form a convenient group for moving the cursor, as shown in Figure 1. The four keys shown in Figure 2, which form a diamond at the left of the keyboard, will be used for drawing and filling as indicated in that figure.

This description gives our main program as:

Set up the high-resolution screen
Create and position a sprite for the cursor
Repeat
When a key is pressed
If it is an "I" then move the sprite up
If it is a "J" then move the sprite to the left
If it is an "L" then move the sprite to the right
If it is an "M" then move the sprite down
If it is an "S" then start a drawing
If it is a "D" then draw a line to this point
If it is an "E" then end the drawing
If it is an "X" then fill the region with colour
End repeat

Writing the program

The above description converts directly to lines 10 to 120 in the program listing, giving us the main body of the program.

We have used high-resolution graphics in previous projects, and the subroutine starting at line 1000 for setting up this mode of display is one that we have used before. We have also used sprites previously. Describing the cross shapes for sprite 0 and placing this sprite on the screen is done by the subroutine starting at line 2000, very similar to routines used earlier in the series. Once on the screen, the sprite is moved by lines 40 to 70, which simply increase or decrease the numbers in the registers that hold its row or column numbers.

Pressing "S" to begin a drawing causes the column and row positions of the cursor to be stored in XB and YB, so that the start position will be available when the drawing is to be completed. This position is then copied into X1 and Y1. To

1000	To set up the high-resolution graphics screen.
2000	To create the sprite for the cursor and place it in its initial position.
3000	To draw an unbroken straight line. Line 3010 detects vertical lines, and lines 3080 to 3110 draw them. Line 3020 detects lines with slopes exceeding 45 degrees, and lines 3130 to 3160 draw them.
3500	To plot a point at a given row and column position. This routine is called repeatedly by the line-drawing subroutine to plot a series of points along the path of the line.
4000	To fill an area from the cursor to the edge of a region.

Figure 5

Program Listing

```
10 GOSUB 1000: REM PREPARE HIRES SCREEN
20 GOSUB 2000: REM CREATE CURSOR SPRITE
30 GET A$: IF A$="" THEN 30
40 IF A$="I" THEN POKE 53249, PEEK(53249
)-5
50 IF A$="J" THEN POKE 53248, PEEK(53248
)-5
60 IF A$="L" THEN POKE 53248, PEEK(53248
) + 5
70 IF A$="M" THEN POKE 53249, PEEK(53249
) + 5
80 IF A$="S" THEN XB=PEEK(53248)-12: X1=
XB: YB=PEEK(53249)-40: Y1=YB
90 IF A$="D" THEN X2=PEEK(53248)-12: Y2=
PEEK(53249)-40: GOSUB 3000: X1=X2: Y1=Y2
100 IF A$="E" THEN X2=XB: Y2=YB: GOSUB 3
000
110 IF A$="X" THEN X=PEEK(53248)-12: Y=P
EEK(53249)-40: GOSUB 4000
120 GOTO 30
1000 POKE 53272, PEEK(53272)OR 8
1010 POKE 53265, PEEK(53265) OR 32
1020 FOR I=8192 TO 16191: POKE I, 0: NEX
T I
1030 FOR I=1024 TO 2023: POKE I, 161: NE
XT I
1040 RETURN
2000 FOR K=0 TO 60 STEP 3
2010 POKE 832+K, 0: POKE 832+K+1, 16: PO
KE 832+K+2, 0
2020 IF K=33 THEN POKE 832+K, 255: POKE
832+K+1, 255: POKE 832+K+2, 255
2030 NEXT K
2040 POKE 2040, 13
2050 POKE 53269, 1
2060 POKE 53287, 0
```

Program Listing (cont.)

```
2070 POKE 53248, 160: POKE 53249, 100
2080 RETURN
3000 DX=X2-X1: DY=Y2-Y1
3010 IF DX=0 THEN 3080
3020 IF ABS(DY/DX) > 1 THEN 3130
3030 FOR C=X1 TO X2 STEP SGN(DX)
3040 R=INT(Y1+(C-X1)*DY/DX)
3050 GOSUB 3500
3060 NEXT C
3070 RETURN
3080 C=X1
3090 FOR R=Y1 TO Y2 STEP SGN(DY)
3100 GOSUB 3500
3110 NEXT R
3120 RETURN
3130 FOR R=Y1 TO Y2 STEP SGN(DY)
3140 C=INT(X1+(R-Y1)*DX/DY)
3150 GOSUB 3500
3160 NEXT R
3170 RETURN
3500 RO=INT(R/8): CO=INT(C/8)
3510 L=R AND 7
3520 BIT=7 - (C AND 7)
3530 BYTE=8192 + RO*320+ CO*8+ L
3540 POKE BYTE, PEEK(BYTE) OR 2^BIT
3550 RETURN
4000 C=X: R=Y: Y=Y+1
4010 RO=INT(R/8): CO=INT(C/8)
4020 L=R AND 7
4030 BIT=7 - (C AND 7)
4040 BYTE=8192 + RO*320+ CO*8+ L
4050 IF(PEEK(BYTE) AND 2^BIT)<> 0 THEN R
ETURN
4060 POKE BYTE, PEEK(BYTE) OR 2^BIT
4070 C=C+1
4080 RO=INT(R/8): CO=INT(C/8)
4090 L=R AND 7
4100 BIT=7 - (C AND 7)
4110 BYTE=8192 + RO*320+ CO*8+ L
4120 IF(PEEK(BYTE) AND 2^BIT)<> 0 THEN 4
000
4130 POKE BYTE, PEEK(BYTE) OR 2^BIT
4140 GOTO 4070
```

get the actual screen co-ordinates we must subtract numbers from the contents of the position registers to compensate for two factors. First, the sprite position is not the same as the dot position on the high-resolution screen. Secondly, a sprite is positioned by its bottom corner, and we are taking positions from the cross-point at the centre of the sprite.

Pressing "D" causes the current position of the sprite to be stored in X2 and Y2, then a subroutine is called to a line from (X1, Y1) to (X2, Y2), and then copies X2 and Y2 into X1, Y1 ready to draw the next line. The subroutine for drawing the line starts at line 3000, and again is one that we have used before, except that it has been modified to ensure that it always draws a continuous line. This will be important when we write the routine for filling a region with colour. The subroutine operates by repeatedly calling the subroutine starting at line 3500, which simply plots a point at the current position.

Pressing "E" indicates the end of a drawing, and causes a line to be drawn from the last point to the first one, giving a drawing that consists of a closed contour. The sequence of key presses that is necessary to create a drawing is illustrated in Figure 3.

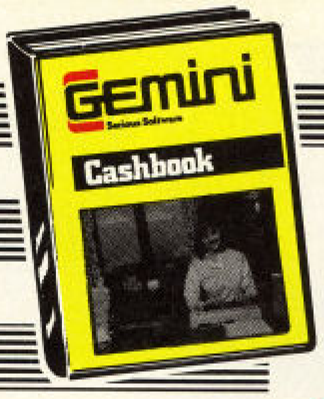
Now we come to the routine for filling a region with colour. Ideally, since the drawing part of our program always gives a closed contour, we should like to place the cursor inside a contour, to indicate the region to be coloured, and have the 'painting' routine do the rest. Although this can be done, it is far from simple. The subroutine presented here, which starts at line 4000, fills an area that extends to the right and down from the cursor position, and stops at the edge of the region. The sort of area that it will fill depends on the shape of the contour, and on the position of the cursor relative to it. Two examples of what it does are shown in Figure 4.

This fairly rudimentary filling routine should provide a basis from which you can develop a better one. It can also be used in its own right to fill most of a region by using it repeatedly to fill gaps left by its previous applications.

The routine starts by drawing a horizontal line to the right from the cursor position to the edge of the region. This is why the line-drawing routine must produce continuous lines. If there are any gaps then our horizontal line will go straight through them. The program then moves the drawing position down by one line from the cursor position and draws another horizontal line to the edge of the region. It repeats this until the starting position for the next horizontal line hits the edge of the region.

Figure 5 gives a summary of the subroutines used by the program and their actions.

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OXFORDSHIRE

Abingdon. Ivor Fields Computers, 21 Stern Street. tel: 0235 21207.
Banbury. Computer Plus, 2 Church lane. Tel: 0295 55890.
Oxford. Absolute Sound & Video, 19 Old High Street, Headington. Tel: 0865 65661.
Oxford. Science Studio, 7 Little Clarendon Street. Tel: 0865 54022.

SCOTLAND

Aberdeen. Boots, 133-141 Union Street. Tel: 0224 585349.
Edinburgh. Boots, 101-103 Princes Street. Tel: 031-225 8331.
Glasgow. Boots, 200 Sauchiehall Street. Tel: 041-332 1925.
Glasgow. Boots, Union Street and Argyle Street. Tel; 041-248 7387.
Glasgow. Tom Dixon Cameras, 15-17 Queen Street. Tel: 041-204 0826.

SHROPSHIRE

Shrewsbury. Clairmont Enterprises, Hills Lane. Tel: 3647 52949.
Shrewsbury. Computerama, 13 Castlegate. Tel: 0743 60528.
Telford. Computer Village Ltd, 2/3 Hazeldine House, Central Square. Tel: 0952 506771.
Telford. Telford Electronics, 38 Mall 4. Tel: 0952 504911.

STAFFORDSHIRE

Newcastle-under-Lyme. Computer Cabin, 24 The Parade, Silverdale. Tel: 0782 636911.
Stafford. Computerama, 59 Foregate Street. Tel: 0785 41899.
Stoke-on-Trent. Computerama, 11 Market Square Arcade, Hanley. Tel: 0782 268524.

SUFFOLK

Bury St. Edmunds. Boots, 11-13 Cornhill. Tel: 0284 701516.
Bury St. Edmunds. Suffolk Computer Centre, 1-3 Garland Street. Tel: 0284 705503.

SURREY

Bagshot. P & H Electronics, 22-24 Guildford Road. Tel: 0276 73078.
Croydon. Laskys, 77-81 North End. Tel: 01-681 8443.
Croydon. The Vision Store, 53-59 High Street. Tel: 01-686 6362.
Croydon. The Vision Store, 96-98 North End. Tel: 01-681 7539.
South Croydon. Concise Computer Consultants, 1 Carlton Road. Tel: 01-681 6842.
Epsom. The Micro Workshop, 12 Station Approach. Tel: 0372 721533.
Guildford. Walters Computers, Army & Navy, 105-111 High Street. Tel: 0483 68171.
Wallington. Surrey Micro Systems, 53 Woodcote Road. Tel: 01-647 5636.
Woking. Harpers, 71-73 Commercial Way. Tel: 0486 225657.

SUSSEX

Bexhill-on-Sea. Computerware, 22 St. Leonards Road. Tel: 0424 223340.
Brighton. Boots, 129 North Street. Tel: 0273 27088.
Brighton. Gamer, 71 East Street. Tel: 0273 728681.
Brighton. Laskys, 151-152 Western Road. Tel: 0273 725625.
Crawley. Gatwick Computers, 62 The Boulevard. Tel: 0293 37842.
Crawley. Laskys, 6-8 Queensway. Tel: 0293 544622.
Eastbourne. Boots, 15 Eastbourne Arndale Centre. Tel: 03232 7742.

TYNE & WEAR

Newcastle-upon-Tyne. Boots, Eldon Square. Tel: 0632 329844.
Newcastle-upon-Tyne. Laskys, 6 Northumberland Street. Tel: 0632 617224.
Newcastle-upon-Tyne. RE Computing, 12 Jesmond Road. Tel: 0632 815580.

WALES

Aberdare. Inkey Computer Services, 70 Mill Street, The Square, Trecynon. Tel: 0685 881828.
Aberystwyth. Aberdata at Galloways, 23 Pier Street. Tel: 0970 615522.
Cardiff. Boots, 26 Queens Street & 105 Frederick Street. Tel: 0222 31291.
Cardiff. Randall Cox, 18/22 High Street Arcade. Tel: 0222 397162.
Mold. Clwyd Personal Computers, Unit 19, Daniel Owen Precinct. Tel: 0352 56842.
Newport. Gwent Computers, 92 Chepstow Road. Tel: 0633 841760.
Swansea. Boots, 17 St. Marys Arcade, The Quadrant Shopping Centre. Tel: 0792 43461.
Swansea. The Microstore, 35-36 Singleton Street. Tel: 0792 467980.

WARWICKSHIRE

Coventry. Coventry Micro Centre, 33 Far Gosford Street. Tel: 0203 58942.
Coventry. Impulse Computer World, 60 Hertford Street Precinct. Tel: 0203 553701.
Coventry. JBC Micro Services, 200 Earlsdon Avenue, North Earlsdon. Tel: 0203 73813.
Coventry. Laskys, Lower Precinct. Tel: 0203 27712.
Leamington Spa. IC Computers, 43 Russell Street. Tel: 0926 36244.
Leamington Spa. Leamington Hobby Centre, 121 Regent Street. Tel: 0926 29211.
Nuneaton. Micro City, 1a Queens Road. Tel: 0203 382049.
Rugby. O.E.M., 9-11 Regent Street. Tel: 0788 70522.

WEST MIDLANDS

Birmingham. Boots, City Centre House, 16-17 New Street. Tel: 021-643 7582.
Birmingham. Laskys, 19-21 Corporation Street. Tel: 021-632 6303.
Dudley. Central Computers, 35 Churchill Precinct. Tel: 0384 238169.
Stourbridge. Walters Computer Systems. 12 Hagley Road. Tel: 0384 370811.
Walsall. New Horizon, 1 Goodall Street. Tel: 0922 24821.
West Bromwich. DS Peakman, 7 Queens Square. Tel: 021-525 7910.

YORKSHIRE

Bradford. Boots, 11 Darley Street. Tel: 0274 390891.
Leeds. Boots, 19 Albion Arcade, Bond Street Centre. Tel: 0532 33551.
Sheffield. Laskys, 58 Leopold Street. Tel: 0742 750971.
York. York Computer Centre, 7 Stonegate Arcade. Tel: 0904 641862.



Phone 01-278 3143 for your free information pack now!

Micronet 800, 8 Herbal Hill, London EC1

Teacher's Pet

Margaret Webb dons her mortar board for the start of a regular look at the Commodore education scene.

THE ABILITY TO READ IS ONE OF OUR most important acquisitions, and is something that many of us cannot remember learning to do. Others, however, find a very difficult exercise, which may stem from early failure leading a person to decide that he does not want to learn to read, thus closing all the experiences reading brings.

Your Commodore 64 computer can be of help in introducing your child to reading and will hopefully, keep his interest so that he is encouraged to go on learning. To help you there is a variety of software available from software houses and publishing firms.

Talking to the child about everyday events and getting the child to talk is an important first step in learning to read. There are several games which will help you to expand on this process whilst playing games and having fun. Commodore markets two excellent packs for this step.

Get Ready to Read with B.J. Bear is a pack of four cassettes, a children's book and a parents' guide. Using a cuddly teddy as its central character it starts with vocabulary and memory training and works in a sure and steady way through listening and auditory discrimination to learning the letters of the alphabet and the sounds they make. All of the games are colourful and fun to play.

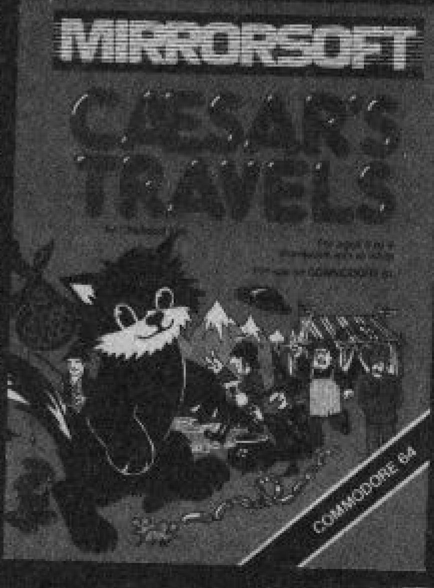
Hide and Seek by A.S.K. (again marketed by Commodore) is a pre reading vocabulary set which is based on a memory game – which picture is missing? There are four games in the pack. The early games are very easy but as they progress more discussion is needed before an answer can be given.

Another good game of this type is **Mr. T Meets His Match,** in which shape, colour and size of objects is discussed. All of the above are for the 3-year old age group upwards but it must be stressed that they need to be with an adult: the computer can only be used as a teaching aid, not as an end in itself.

Once a basic vocabulary and a rapport between parent and child is established alphabet work can be introduced in earnest. **Mr T's Alphabet Games** (Good Housekeeping) and **Kids on Keys** (Spinnaker) both keep the young child on their toes as they match and learn letters. Mr. T. then shows the child how the letters are written whilst going on to match simple words with pictures. Both these games have arcade type action to help keep the child's attention.







The next stage is looking at the symbols, realising that they are words with meaning and then learning the words. One way of doing this, also used in some schools, is the flashcard method. This has been successfully transferred to the computer by a small firm, Toddlersoft, using lots of familiar everyday words with colourful animated illustrations. One section is based upon the Griffin Pirate reading series, a favourite first reading scheme used in some schools.

Once over the initial hurdles of alphabet and first word learning it is useful to show the child what fun reading can be. This can, of course be done with conventional books; however the computer's graphics capabilities add another dimension. Mirrorsoft has a delightful package of cassette and book called **Caesar's Travels** which fits this bill. The cassette is an animated storybook in which the child reads part of the story and then decides which option to take to continue the story. The book included in the pack has the same stories and some beautiful illustrations for the child to colour. As there are about twenty different endings to the story the pack can be used time after time.

Mr. T's Jungle Stories is a double-sided cassette. On one side is the story of animals moving through the jungle to reach a raft floating down the river. The reader decides how the animals move and thus determines whether the animal reaches the raft or falls in the river.

Jungle Challenge lets the child build up a story choosing characters, setting etc., and then replays the story for the child to read. Both games are well animated and have amusing sound effects.

To recap, there are four basic steps in learning to read:-

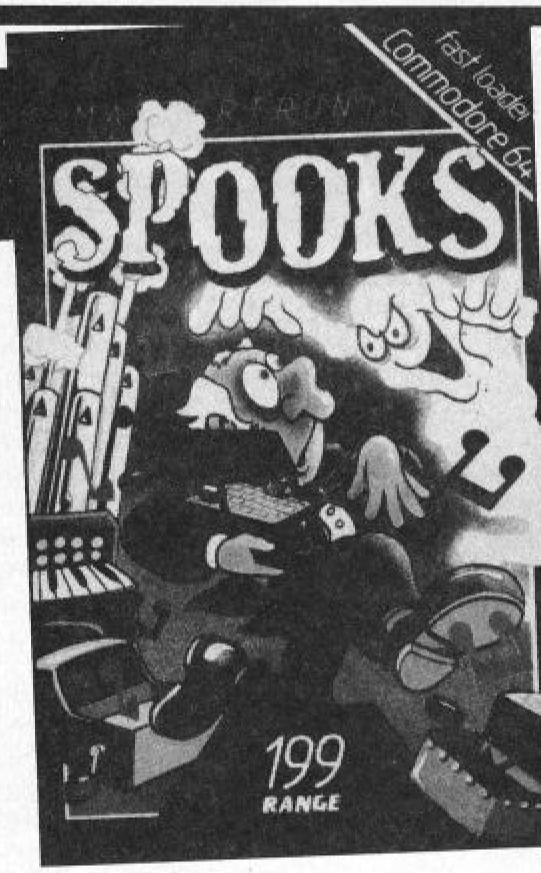
1 Vocabulary building and memory training. Talk to your child at every opportunity – even the small baby will benefit from conversation.
2 Alphabet recognition and learning the sounds that go with each letter. Remember it is the sound and not the letter's name that counts.
3 First words
4 Using what has been learnt to read a story.

Overall make learning fun. Take it in short sessions at a pace to suit your child; too much pressure can lead to early failure and so defeat the object. Once these stages have been worked through your child should have a foundation on which to build and hopefully he will discover the joy of reading and will want to learn more.

Software Spotlight

Spooks

★ ★ ★ ★
Mastertronic
£1.99
CBM 64 and joystock (optional)



RELEASED AS ANOTHER IN THEIR LINE of 'Pocket money' games. Spooks from Mastertronic is an arcade adventure come maze game with elements of 'Pac-man'. You move a little man around a scrolling maze, picking up and using various objects that are lying around whilst avoiding the ghosts which of course bring instant death. The object of all this action is a search for the Death march, bits of which are trapped inside eight musical boxes within the maze.

Having collected the whole tune you then take it to the exit and play it to win. This is not as easy as you might imagine as many of the objects you will find are useful whilst others are actively harmful, there being no way of finding out which is which other than by trial and error.

If the game seems a little morbid this is offset by a colourful screen display of, admittedly, low-res graphics. Although the program may not appeal to dedicated arcade players I feel that it caters well for the market at which it is aimed and should provide the younger section with hours of fun.

One last comment, the loading screen is one of the best I've yet seen, almost worth buying the program for.

D.J.T.

Fourth Encounter

★ ★ ★
Sparklers/Thorn EMI
£2.50
Vic 20+8K Expansion

FOURTH ENCOUNTER IS YET ANOTHER zap-everything-in-sight game for software starved VIC owners. As it stands though it is quite a good shoot out, although hardly original.

The cassette inlay instructions waffle about a 'power crazy alien force' trying to overrun your planet and turn the inhabitants into slaves. This alien force is sending the obligatory wave after wave of nasties for yo to do battle with.

There are various game options which can be selected from the main menu. These include one or two player games, skill level, one phase game. The latter option allowing you to practice any of the first four levels.

The aliens come in various forms and most of them have irregular movement patterns. Your ship can move left and right on lower levels but can also move up and down on later ones, and of course it can fire missiles.

Well, thats about all I can really say about this game. Nothing original with fairly ordinary graphics and the usual 'zap/pow' sound effects. I should think VIC owners are fed up with shoot 'em ups by now.

P.R.R.

Theatre Europe

★ ★ ★ ★ ★
P.S.S.
£9.95
CBM 64 + joystick

LET IT BE KNOWN HERE AND NOW that I am and have been for more than twenty years a confirmed wargamer, and shall continue to be so until I can no longer move the pieces. With this in mind it should be apparent that any war simulation game will come under extreme scrutiny and severe criticism from yours truly, it will have to be good to get past me!

Theatre Europe from Coventry based P.S.S. is an awe inspiring piece of software. Superbly packaged in a large video type case, the game comes complete with fictional news sheet to set the scene, colour map of the battle area and a deceivingly thin intruction booklet, all of the best quality.

The game itself purports to be "The ultimate conflict simulation" and is set in Europe in October 85! The object of the game is to either defend or overrun West Germany, depending if you play N.A.T.O. or Warsaw Pact. Although the Battle map stretches from Spain to Moscow the actual action only really exists down the East/West German border, it is possible to move to other countries, but as the game depends on who controls Bonn after 30 days, movement away from Germany is pointless.

Once booted up you're first confronted with the Playing options, NATO or Ruskie, skill level etc, after this comes the playing area/map, complete with all pieces in position, there's no alternative start positions. As with a lot of wargames you proceed to play in game phases ie. phase one of turn one is NATO equipment, phase two is NATO attack etc, then the computer has it's turn (no two player computer has it's turn (no two player option here!). Under your control are all your land based units, all the Allied Air forces and of course the tactical nuclear option, which is what this game is all about. Running across the top of the game map is the Text Line, where game messages, information etc is displayed. Movement of your forces is by joystick, as is the allocation of reserves and reinforcements, this system works very well.

This is a strategy game through and through, you will have to think your way to victory every step of the way. To appease the arcade freaks there is a little battle sequence where you can fire guided missiles at the oncoming enemy, but this screen really adds nothing to the game and can easily omitted without loss.

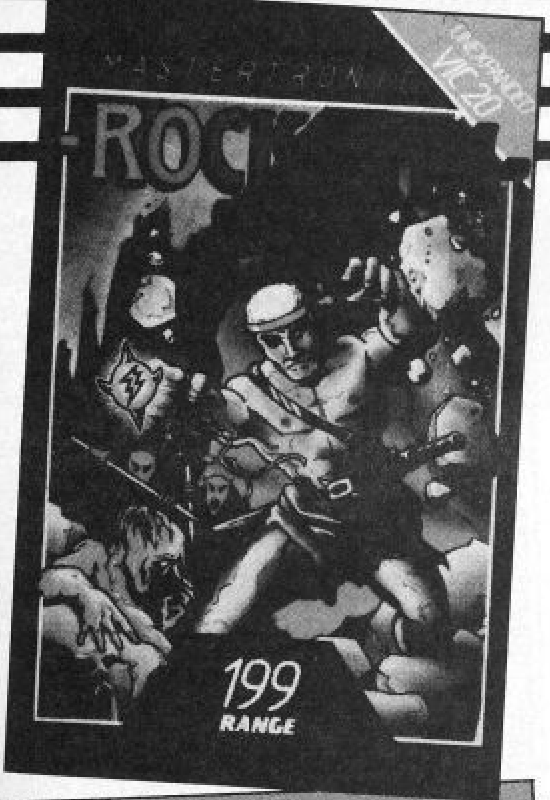
Graphically the display is very strong without being brilliant so to is the sound, but both pale into insignificance when compared to the overall concept and playability of the game, without double Threatre Europe is streets ahead of its nearest rivals, the impact when you are finally forced to hit the "NUKE" button has to be seen to be believed. A review of this size cannot hope to do this game justice.

Theatre Europe isn't perfect, on one occasion the game "hung" for no apparent reason forcing a re-load, a two player option I would have thought was a must and the lack of any other scenarios all go against it, but still PSS have the best game of it's type around.

Any serious wargamer must get a copy of this at any cost, oh and by the way don't forget to have your telephone next to you when you hit that Nuke button, you'll need it, and FAST!

Five stars absolutely no question.

M.T.U.



Rockman

★ ★ ★ ★
Mastertronic
£1.99
VIC 20 Unexpanded

ONE OF THE BEST GAMES FOR THE commodore 64 is 'Boulderash'. Now a very similar game has arrived for the unempanded VIC. Rockman is an excellent version of this very popular game.

The instructions for this game include a very complex little story which is irrelevant to the actual game. Briefly, it seems that you arrive back in your country only to find your Father has been murdered by his younger brother. He has then managed to convince your people into believing he is their King. Your only hope is to ask 'the Elders' for help. All they do is send you into some caves to retrieve 160 pieces of a magical Amulet. There are 8 pieces in each cave making 20 caves in all.

In the actual game collecting the pieces of the Amulet is far from easy. Each cave has a different layout of rocks in it. The rocks are supported by earth which you as Rockman can dig away. Also inhabiting the caves are nasty little creatures which follow you round the paths you dig. However, a careful push of a rock onto its head will rid you of it. Once you have collected the 8 pieces in that cave you can head for the exit to the next.

The graphics are all double height and an expanded screen is used. They are all well defined and animated. The sound is also very good although the rendition of 'Popcorn' is a little out of key.

This is an incredible game. The programmer deserves a medal for the sheer variety in screens, graphics, sound effects and playability. There is even a title screen and all in 3.5K of memory! Superb.
P.R.R.

Kikstart

★ ★ ★
Mastertronic
£1.99
CBM 64 + joystick (optional)

ARE THERE ANY EDDIE KID'S OR DAVID Taylor's out there? After playing this game for hours I still can't stay on the bike for more than a few seconds at a time and I feel sure that the skills of the riders mentioned are required to do anything other than fall off.

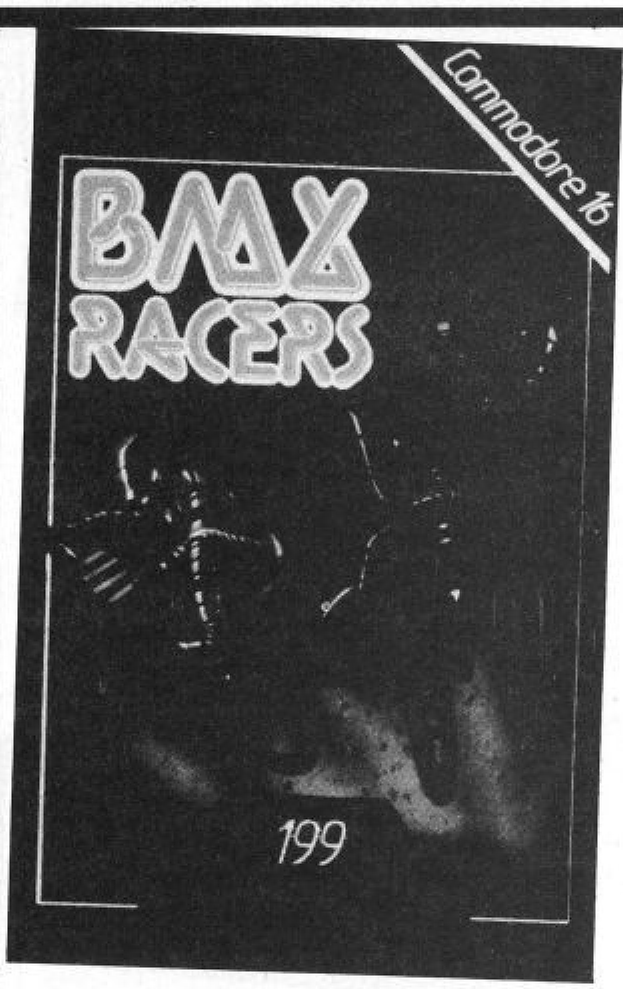
At first glance the graphics are not very inspiring but as you play the game and notice the realistic way in which your man falls to the ground you begin to appreciate the complexity of the program.

You control a stunt motorcyclist over a wide variety of obstacles ranging from jumps over water, vehicles and telephone booths to rough riding over potholes and through hedges. That is 'you' may control the rider, I failed dismally to do anything of the sort and found the game to be very difficult.

The program caters for two players by the neat inclusion of a split screen as in PITSTOP 2, player one using the top half. There are eight different sections on which to try you skill, three of which, together make up one game.

The introduction of software of this quality at such a realistic price can only be applauded and should go someway to discouraging piracy, surely most people can afford a couple of quid for an original game. Well done Mastertronic. **D.J.T.**





BMX Racers

★ ★ ★
Mastertronic
£1.99
Commodore 16 or Plus/4

PUT ON YOUR CRASH HELMET AND hold on tight, because there is nothing slow or tame about this budget-priced game from Mastertronic!

Your aim is to complete a sequence of five obstacle courses, avoiding the hazards and collecting marker-flags as you go. If you miss a single flag you cannot complete the course. At the same time your energy is falling, buit this can be replenished by picking up energy pods along the way. You are able to jump and manoeuvre rapidly – the only thing you can't do is travel slowly! Lightning reflexes and iron nerves will be needed if you intend to complete the course and win the gold cup.

The quality of C16 games is improving all the time, and this is a very worthy offering, especially at only £1.99. The graphics are colourful and detailed, with very smooth vertical scrolling, and the sound effects are interesting. This is not just a translation of Mastertronics' game of the same name for the 64. This one is far superior and well worth buying. Don't expect to finish it in a hurry, though. After several hours play I have still not gone further than course 2! **P.R.B.**

Software Spotlight

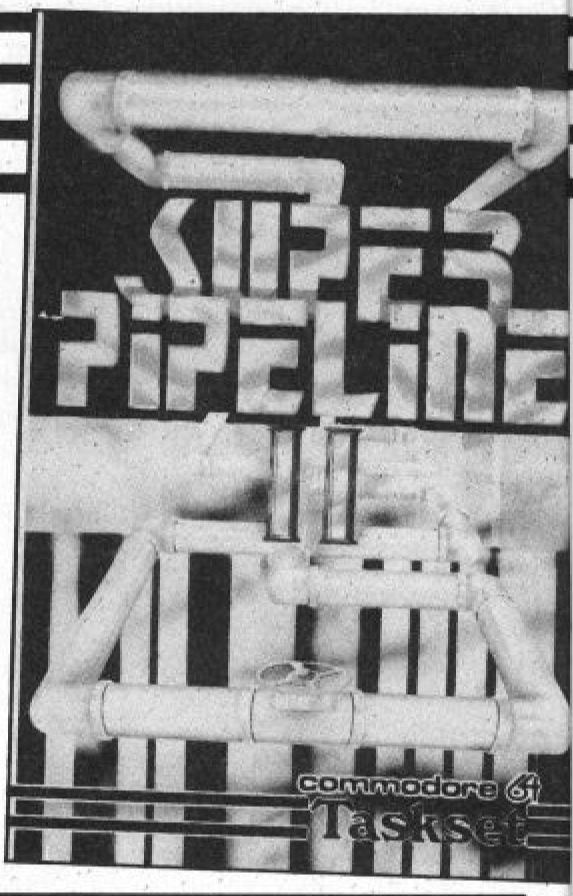
Super Pipeline II

★ ★ ★ ★
Taskset
£8.90 cassette, £11.99 disc
CBM 64

A NEW GAME FROM TASKSET IS always worth waiting for and this is no exception, although it is not really original. As Foreman Fred you have to protect a series of water pipes into the barrels at the bottom are full. You are assisted by a supply of workmen who, cynically, are completely expendable and may be sacrificed to save yourself.

All the features of the original Super Pipeline have been kept, including its nightmare-like quality. Now, however, the nightmare has become more intense as there are constant attacks from scores of baddies! Some make leaks in the pipe; others are difficult or impossible to kill. You race around, collecting workmen to repair leaks and shooting everything that moves! The game is much faster and more challenging than the original.

It is impossible to fault Taskset for the sheer professionalism of their games. The graphics are excellent, showing the full potential of sprites, and the musical soundtrack is quite superb. If you already own Pipeline I, you may think £8.90 too much to pay for what amounts to an upgrade. If you don't, then this is a game you must try to buy! **P.R.B.**



R.I.P.

★ ★ ★ ★
Mastertronic
£1.99
VIC 209 Unexpanded



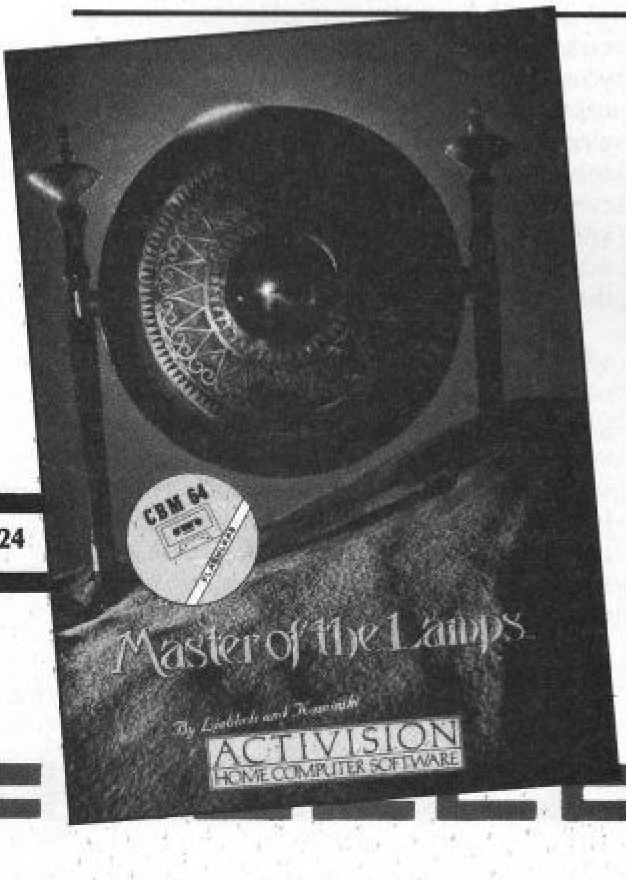
THIS GAME IS VERY SIMILAR IN DESIGN and concept to mastertronics other title for the VIC called 'Rockman'. However it is still a very good game and a great feat of programming in limited memory space.

You must enter the 'Crypts of Darkness' and recover the 20 chalices of truth which have been stolen from your King. Once all the pieces have been found and assembled, then all evil will be banished from the Kingdom. There are twenty Crypts in all, each containing one piece of the Chalice. Guarding the Crypts are a number of nasties which make your task far from easy.

As with 'Rockman' some very effective data compression routines have been used to give the player as much variety as possible in 3½K of memory. The twenty Crypts are all different and contain different numbers of nasties and passage ways. Some screens appear as mazes, some in the form of skulls or outlines of men.

Graphics are all well defined and are in double height on an expanded screen. Sound is also quite good and fairly varied.

Despite the similarities between this and 'Rockman' it is still worth a look especially at the superb price. VIC software is very low on the ground nowadays and I just wished it was all as good as this. Cheap but not nasty.
P.R.R.



Master of the Lamps

★ ★ ★
Activision
£9.99
Commodore 64 + joystick

NO, IT'S NOT A COMPUTER VERSION of Aladdin but a new and rather unusual game, in which a series of evil genies have to be captured and shoved back into their lamps.

In case you are not familiar with the ancient oriental art of genie-bottling, let me put you in the picture. Two stages are involved. First you fly rapidly on a magic carpet through a tunnel which wriggles about all over the place. Then you have to strike a succession of coloured gongs in the correct order, to neutralise matching musical notes which the genie throws at you. They really are ingenious genies!

The game is original and requires several skills. Flying through the tunnels calls for very rapid manipulation of the joystick, while, as well as speed, a good memory will be needed to hit the right gongs. On the higher levels the colours disappear and you rely entirely on your ear for music! If you fail, you are not killed but have to start again on the same level. This can become tedious.

The game's graphics are good and there is an excellent soundtrack. However, there is little real variety, so I fear it might quickly become boring. An interesting idea, but not sufficiently developed. **P.R.B.**

Jonah Barrington's Squash

★ ★ ★ ★
Newe Generation Software
£7.95
CBM 64

WITH THE AMOUNT OF TIME I actually spend on the squash court apparently in the name of fitness, probably the last thing I need is a simulator for the computer. But then perhaps the best thing I could have is a few tips from one of the all time masters like Jonah Barrington.

Needless to say this is an excellent game which follows, as closely as possible, the proper rules of square and represents them on screen with brilliant graphics. So on with the action.

You can choose a one, three or five game match as well as the spot of the ball you play with ranging from red, which is easy, through blue and white to yellow, which is hard.

Naturally squash is a two player game and you also have the choice of playing against the computer itself or a human and perhaps more fallible opponent. But then the computer player is not adverse to being rear-ended. The computer is remarkably fair in this respect. Well as fair as any computer can be!

Surprisingly the game doesn't have to be played using a joystick, although it is easier. Full movement around the court can be achieved through the keyboard using keys which you can designate. Whether you play a back hand or a fore hand depends on your position relative to the ball. To actually strike the ball you simply use the fire button and the angle at which you strike the ball varies according to how long you hold the button down. There are six different angles at which the ball can fly from the raquet.

With the addictiveness of the game, I guess my fitness is going to begin to suffer from this more sedentary style of game!

K.M.



Skyjet

★ ★ ★
Mastertronic
£1.99
CBM + joystick



A GRAPHICALLY EXCELLENT PICTURE, almost a photograph, of a helicopter appears on screen during loading, giving some clue as to what this game is about.

The aim is to pilot a helicopter, gathering up supplies and equipment for the good guys and delivering them to bases while at the same time avoiding enemy gunfire. It also helps if, in idle moments, a few depth charges are aimed at numerous submarines carrying enemy reinforcements.

Nothing special really and on first playing the game did disappoint as the object was none too clear. Clarity soon returned by opting for a low skill level (there are ten in all) and although graphics and sound were hardly Minteresque the game did require a fair bit of dexterity with the old wrist and trigger finger.

Quite a pleasant romp all in all with well defined if slightly jerky graphics showing the land bases, seas and numerous combatants both aflight and afloat. Sounds could be adapted to personal taste with a joystick controlled option before each game.

Skyjet features about six different screens of ascending complexity but overall the game was not compelling enough to persevere through the progressive levels. It was though a typical Mastertronic game, well produced with no pretensions but including a few features usually carried by only the more expensive games. Good value at the price.

R.M.

Gribbly's Day Out

★ ★ ★ ★
Hewson Consultants
£7.95
Commodore 64 + Joystick

AS GRIBBLY-GROBBLY, YOU PLAY A creature of enormous brain power, type-casting, do I hear you say? In fact you are an odd-looking, one legged froglike animal, but very endearing for all that!

The scene is set on your home planet of Blabgor – a strange land of floating islands with deadly rocks and plants, shrouded in an energy web designed to contain the wicked Seon. You, as Gribbly, have a lot of trouble with your children, the Gribblets, who keep wandering off into dangerous places. Your rask is to rescue them from peril by carrying them back to your cave. To move, you bounce along the ground but you can also levitate and fly, using the immense power of your mind.

Despite the silly name, this is one of the best and most original games I have seen recently. The graphics are bold and colourful, while Gribbly's expressions and the antics of the Gribblets are really amusing. The sound effects are excellent and real skill is needed to avoid the many hazards. There are sixteen screens, each showing a different area of the planet's surface.

Had it not been for loading difficulties and the lack of a score table, I would have given the game five stars. Even so I recommend it very highly – a first rate game!

P.R.B.

Software Spotlight

Operation Whirlwind

★ ★ ★ ★
Ariolasoft
£11.95 (cassette) £14.95 (disc)
CBM + joystick



AT LONG LAST REAL WARGAME simulations are beginning to appear, we've had Combat Commander for some time and for those among us who can afford the £40+ asking price there are the unbeatable SSI games from America. However reasonably priced good quality wargames just don't exist, until now that is, for Ariolasoft have come to our rescue by bringing Broderbunds Operation Whirlwind out at a decent price.

Whirlwind is a graphic WW2 strategy simulation, you are the Battalion Commander of an armoured task force ordered to take and hold a city fifteen kilometres away, between you and it are two rivers and a numerically superior enemy.

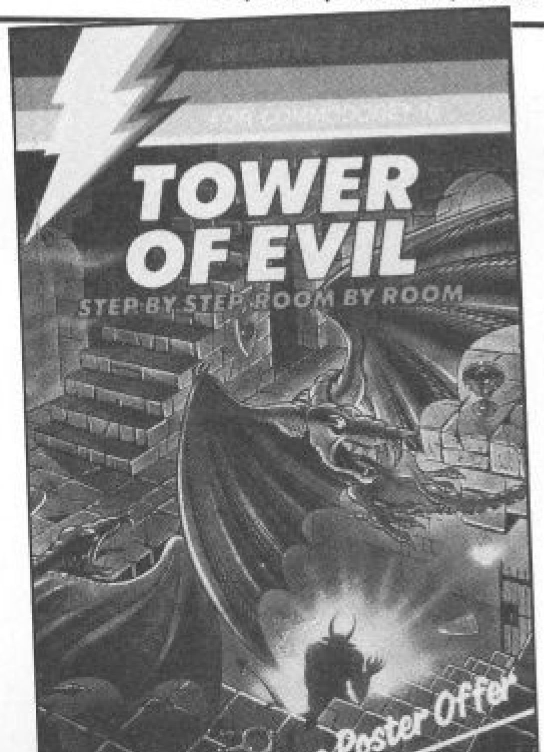
The first thing you are asked to do after loading is to input one of four skill levels from introductory to advanced, then you're into the game with a vengeance. As usual with wargames the game turns are divided into phases, Command, Movement, Combat, Assault Order and Assault. Control of your forces, both armour and infantry is by joystick, position the cursor over the piece press the fire button to pick up the unit, move and fire again to drop the piece in the required position.

Throughout the game the enemy's units remain invisible to you until they fire, by then of course its too late. The battle area scrolls sideways as you move so that you are not limited to just one screen. The background graphics are really first class, just enough to look realistic and sparse enough to give your forces room to manoeuvre. The pieces themselves are rather small and can be difficult to differentiate at first but after about 30 minutes play you soon get the gang of them. Sound is naturally rather limited, but is well done when called for.

Operation Whirlwind is fast, looks nice, plays very very well and keeps you coming back for more time after time. There is however one hideous, enormous, unforgivable BUG, Ariolasoft should be told that even with todays sophisticated weapons, shells do not go round corners, in all my years of wargaming I've never hit a tank in the rear whilst facing its front, not until I played O.W. that is. However don't let this detract you from buying this excellent game, almost full marks. **M.T.U.**

Tower of Evil

★ ★ ★
Creative Sparks
£5.95
CBM 16, Joystock or Keyboard



IMPRISONED ON THE TOP FLOOR OF an eight-storey tower is a beautiful princess – whose name is Diana, no less! The building belongs to a wicked necromancer and is protected by a bewildering array of evil minions, glorying in such names as Valifors and Baphomets. They have only one aim, which is to put paid to you, once and for all!

Fortunately, you are not defenceless – you are able to hurl fireballs from your fingertips as you race from room to room. On each floor, you have to find a key to get you up the stairs to the next storey. The trouble is that the baddies tend to lurk in doorways waiting for you. Occasionally, however, you come across a magic goblet, which makes you invincible for a time. There are also piles of gold, which score highly and give you bonus points when you reach the top floor.

This is a fairly straight translation of an earlier game for the 16K Vic-20. Few changes have been made but the graphics are rather more detailed. Plus/4 owners should note that this game, like one or two others for the C16, will not run on their machines.

It is a good, solid sort of game and worth adding to your collection.

P.R.B.

Elidon

★ ★
Orpheus
£8.95
CBM 64 + Joystick or Keyboard

ELIDON IS A FRIENDLY LITTLE GAME IN which you are a fairy – although it is spelt faerie so as not to appear rude!

Your task is to flit around the magic forest in search of seven lost potions. The forest glades take the form of an enormous number of interconnecting chambers, in which the walls, ceilings, plants and moving objects are all dangerous. Any contact diminishes your faerie energy. Occasionally you find faerie dust, which scores bonus points and replenishes your power. There are also lucky charms, which are worth collecting, though you can only carry three of them. Having found the potions, you must take them to the seven flowers of Finvarra to make them bloom.

To add interest, some of the chambers are in pitch darkness, with just the eyes of tree spirits showing occasionally. These are very troublesome as you can bump into hazards and lose energy, without realising they are there. In other caverns force-fields block the doorways. Touching one of these makes you bounce all over the place – and on one occasion caused the program to crash!

The game is pleasant but, despite the faerie element, there is nothing very new or interesting about it. **P.R.B.**

Parky and the Yellow Submarine

★ ★ ★
£6.95
CBM 64

I'M NOT SO SURE ABOUT THE YELLOW Submarine as the Magical Mystery Tour that this game involves. Picture the scenario. Here's this little penguin called Parky who has lost his twin brother Perry in the depths of the South Atlantic subterranean caverns. But like all South Atlantic rescue missions there are plenty of baddies to make the task difficult. Who said it was going to be easy anyway? To make it even worse you can reduce the number of lives you're allowed as well.

Lives are lost by causing Parky to bump into the cavern walls and by failing to avoid the underground nasties. There are also three different skill levels. The higher the skill level, the bigger your starting bonus which gradually ticks away as you move around the caverns.

Dotted around the caverns are plates of fish and chips to give you extra energy and bonus points, lanterns to make Parky invisible and smart bombs which can be used to destroy all the nasties in a cavern.

So much for the positive points. But then I haven't told you that there are 91 caverns to search, that there are closed doors that can only be opened with the right colour keys and the three parts of the mysteriouis Yellow Submarine have to be found before Perry can be rescued.

Oh I almost forgot the special 'help' factor. Collect all the letters in the right order and all the bombs, lanterns and fish reappear in all of the caverns just in case Parky needs them. Just in case Parky feels a little disoriented the package contains a map of the caverns, which, if used to plot the positions of all the items, could win you a free copy of Parky's next adventure.

Just hope it's in the warmer climes of the South Pacific. **K.M.**



Bounty Bob Strikes Back

★ ★ ★
US Gold
£9.95 (cassette) £14.95 (disc)
CBM 64 and joystick

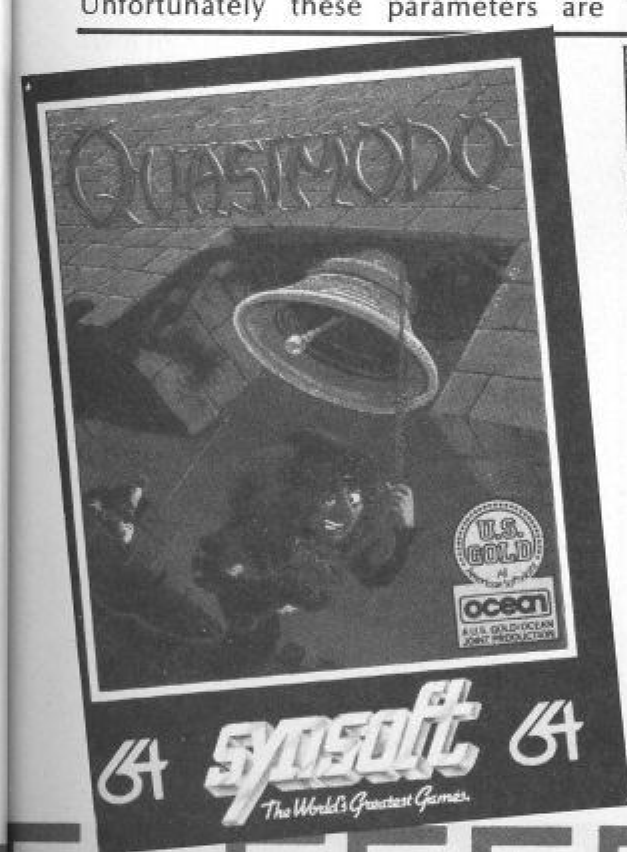
RELEASED UNDER THE ALL ENVELOPING U.S. Gold Label, Bounty Bob is billed as a sequel to Miner 2059er and as such finds Bob once again jumping from platform to platform in a vain attempt to escape the mine, 'sound familiar?' it should do as in the main, the game follows the well-worn format of all platform games.

In all fairness the author has added a mass of facilities by which the program can be tailored to ones individual tastes, difficulty level, number of lives, etc. Unfortunately these parameters are selected with joystick port 2 whilst the game is played with port 1 which means that either you use two 'sticks' or you change ports without powering down not to be recommended).



There are twenty five screens, at least thats what the 'blurb' says, the panel of testers were unable to achieve better than level five.

Each level requires the manipulation of a piece of machinery. For example, screen one requires the use of a matter transmitter, screen two a lift and screen three a suction tube. With graphics that are adequate rather than amazing, good sound and a high score table *is* amazing, the program would have got a higher rating if it had been a pound or two cheaper, as it is I feel that it's somewhat overpriced. Run it and see what you think.



Quasimodo

★ ★
Synsoft (US Gold)
£9.95 (cassette) £14.95 (disc)
CBM 64 + joystick

U.S. GOLD ARE RELEASING MORE software than ever for the 64 or late and Quasimodo is the latest in a long line of, in the main, high quality games. Unfortunately I wonder if they are perhaps rushing programs onto the market as some of their recent releases are not quite as good value as were their earlier releases.

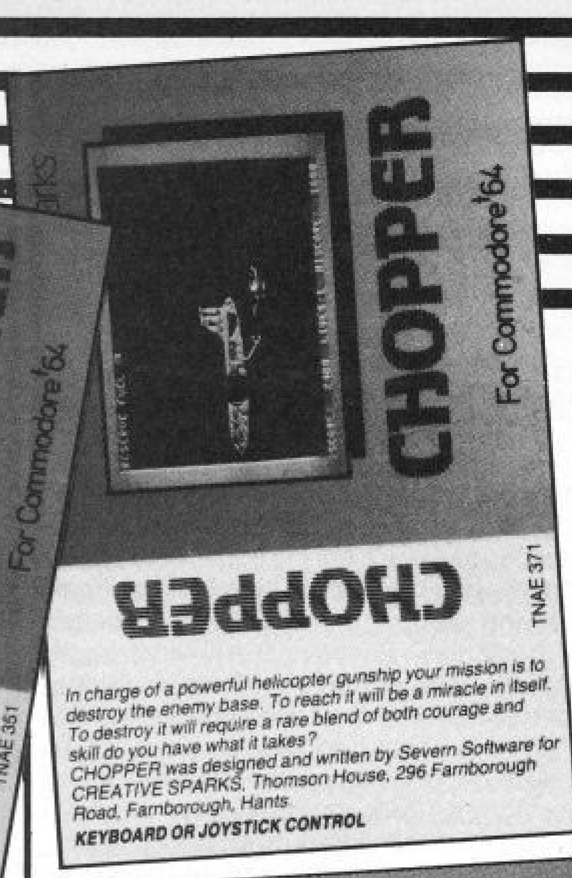
Having loaded Quasimodo, which is on their usual very reliable fast load system, you are faced with the task of protecting Quasimodo from an army of archers who scale the wall on which he stands. Their tactic is a simple one of erecting and climbing ladders whilst firing arrows at you. To dissuad them you drop canon balls taken from one of three heaps on the wall top. As the last of the archers fall to their deaths a jewel will appear and upon retrieving this and placing it into its case, you are transported to the next screen.

Here you may take a breather as completion of level two requires agility rather than violence. Large bells hang from the top of the screen and Quasimodo must make his way to the opposite side of the wall by swinging from bell rope to bell rope in order to find the second of the three jewels.

The game makes good use of the 64, using 48K of memory, and contains adequate sound and graphics, the animation of the main character, in particular, being very good. However, not quite up to the standard that we expect from this company. **D.J.T.**

Software Spotlight





Taskmaster

★ ★
Sparklers/Thorn EMI
£2.50
CBM 64

ONCE UPON A TIME THERE LIVED A beautiful Princess. There also lived a very bold young man who travelled to the strange land where this very Princess lived. The young man fell in love with this Princess and asked to marry her. However the Princess' father, the King, wanted the young man to prove himself and so sent him out on seven dangerous tasks.

There also lived a computer programmer who decided to write a game around this very unoriginal plot. He wrote the game so that you could play the part of the bold adventurer on the quest of the seven tasks. Unfortunately the programmer did not make the game very playable...

Of the seven tasks I have so far managed four of them. The first task has you fighting off Zombies for a night. You must move about shooting at them to keep away their fatal touch until the sun rises.

The second task sends you into a forest in which lives a number of wicked wizards. Again you move around shooting them. In the third task you have to collect four statues whilst fending off blood sucking bats. The fourth has you shooting Evil Worshippers. What comes next I don't know as by this time I was getting very bored and even more frustrated.

The graphics are well done with ancient script style letters. The sprites are large and well animated. Sound however is very sparse. The instructions tell you that each task brings a new challenge. I don't agree, they all involve walking about zapping different sprites in the same way as the last screen.

Its up to you to find out if the beautiful Princess and bold young man live happily every after.

P.R.R.

Chopper

★ ★
Sparklers/Thorn EMI
£2.50
Commodore 64

HELICOPTER GAMES SEEM TO BE getting fairly popular on the '64. What with Airwolf, Super Huey and various others we are getting quite a good selection. However, Chopper is not in the same class as most of the other games.

You are placed in the pilots seat of the latest and most deadly helicopter gunship your airforce has produced. Your mission is to destroy an enemy base built into the side of a cliff. Of course this is an almost impossible task to achieve.

The mission is made up of three sectors and a refueling stage. The first sector is a scrolling dodge'em. You must zap the enemy helicopters and planes whilst avoiding their gunfire. One nasty glitch is that you cannot move up or down while you are fire-ing. The second sector is a scrolling dodge'em. You must fly up and down avoiding the millions of airships and balloons which have suddenly inhabited the skys.

After each of the first two sectors you must dock with a large plane to refuel and gain more points. Then its on to the next sector.

The last sector is the most difficult to complete. You arrive at the cliff housing the enemy base. You have to destroy three shafts by successfully firing a bullet down them. This is far from easy as two indestructable helicopters move up and down as you do. It is very difficult to out wit these craft so that you can deliver your shots accurately.

Some nice graphics and pleasing sound effects make for a fair game. Unfortunately it all becomes to repetetive in the end. Various play options and a high score table don't prevent the game from becoming dull.

P.R.R.

Realm of Impossibility

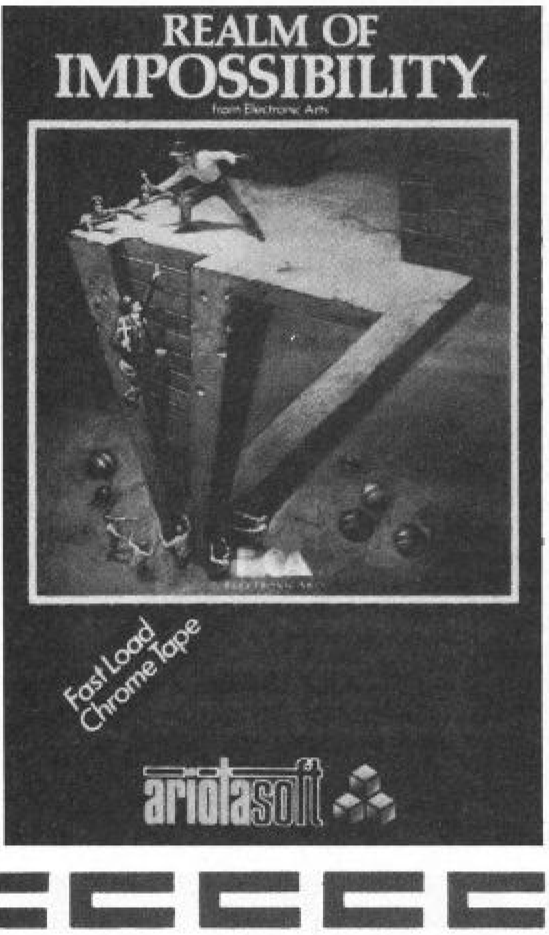
★
Ariolasoft
Commodore 64

JUST BECAUSE SOME IDIOT CLERIC called Wistrik has stolen the seven crowns of the middle kingdoms you have the rather dubious, and not especially envious, task of searching the 13 dungeon strongholds for the crowns and get out alive.

Once inside the dungeons – which you can choose from one by one – you are chased by on-screen squiggles loosely described as zombies, snakes and orbs. These decrease your hit points if they touch you. And they do this until you die.

You want to know more? Then don't read the insert instructions, because they don't even bother to tell you that you need the flip side of the tape loaded to get the game under way. Daft eh? Well as you've probably no doubt guessed I was about as unimpressed as the graphics and signature tune were unimpressive!

K.M.



Ice Palace

★ ★
Creative Sparks
£7.95
CBM 64 + joystick



A REAL TIME ACTION ADVENTURE SAYS the inlay card and I'm prepared to believe there are 1200 locations and seven levels of play as it says.

Ice Palace opens with atmospheric Medieval music, promising much, and totally in keeping to the quest in hand of finding the seven pieces of the Ice Crown hidden in the Ice Palace and guarded by the Ice Queen and her naughty renegades.

The fact that it is played in real time soon becomes painfully apparent as Evil usually wins when time runs away at an alarming rate, mainly because moving the heroic Prince about is so fiddly. While joystick forwards moves the prince forwards, left or right joystick rotates surrounding hexagonal shaped rooms. Joystick back rotates the hero. No easy darting from room to room here – three different actions may be required before moving to the next room.

The screen displays an aerial view of the hexagonal grid showing the hero and different symbols representing artifacts, barriers and hazards. The complex movement mechanics, however, usually result in a rather swift ending with gloomy music signifying the prince's demise. Overall it's a pretty gloomy escapade.

Access can be had to an 'adventure' screen giving a menu of actions to be performed but no time is given to consider choice. A time-out this is not. As the next action is pondered a scale indicates the rising tide of the Ice Queen's hold over the adventure and before you can say 'Moonprince' or such other hallowed words, the game is lost.

While being quite appealing, the game was on the whole tedious. Too much thought seems to have been given to a movement routine quite unsuited to performing even the simplest of tasks with little consideration of how this would fit into the overall structure of a game which is really a maze game with a time limit to beat. Very few games have successfully combined the excitement of the arcade with the intrigue of adventure and Ice Palace is cold on this trail. **R.M.**



Hi Bouncer!

★
Mirrorsoft
£6.95 cassette disk £3 extra
CBM 64

THE FACT THAT THE MR MEN FEATURE in this game might lead you to suppose that it would be suitable for very small children, and first impressions seem to bear that out. The graphics are chunky and attractive, with bright, primary colours like a stroy-book, and the musical accompaniment is catchy and pleasant.

What a pity it is such a useless game! I guarantee that any child under the age of ninety-nine will be screaming with frustration within ten minutes!

You control an unnamed Mr Man who can move left or right and jump. Your objective is different in each of the four screens but you must, at all costs, avoid contact with anything which moves or you will lose a life. Each time that happens you must wait, getting more and more irritated, while your Mr Man bounces aimlessly around the screen for what seems like half an hour!

The game is not just difficult and annoying; it is practically unplayable – yet it says on the insert that it is suitable for young children! Sorry, Mirrorsoft. I suggest that you send Hi Bouncer to that happy bouncing ground for software in the sky, where it surely belongs.

P.R.B.

MODEM

Dave Crisp takes a look at some of the modems that are available for Commodore machines.



IN GENERAL A MODEM IS A MODEM. IF it works you are equal to all others. Most extra facilities (which you pay for) only make life easier once on line so even if you had to buy the cheapest available your mailbox messages still look the same as the persons with 500.00 set up.

I know of many instances where the modem has been purchased and the user has waited days for their Prestel number to arrive. Don't just sit there. Dial up a Prestel number and use the identification 4444444444 and the the password 4444. This will give you access to many interesting demo pages and will allow you to get the hang of moving around Prestel. Also do not forget Bulletin Boards. There is nothing to stop you going around some of them. If you have a modem which will only use 1200/75 do not worry as more and more BB's are using this mode.

PRISM 1000

The Prism 1000 was dealt with a little while ago but it is worth recapping in order to let new readers see what it is all about.

It is not the most sophisticated of packages, being limited to 1200/75 and 1200/1200 but to those just starting out in communications or those who know they will be wanting viewdatea services then it is quite adequate.

The Prism 1000 is certainly uncluttered by switches. There are only two. One selects 1200/75 Viewdata or 1200/1200 the other seizes the line once you have dialled the computer and heard the tone.

The important part of the Prism set-up is the software which arrives with it.

The cartridge based OEL package was easy to use. Everything being more or less self explanatory. It is worth mentioning that if you have an SX-64 the cartridge will not fit and so a little 'hacking' with a Stanley knife and saw would be required to make it fit the cartridge port. The problem is the short 'neck'. It will not allow the connector to make proper contact with the socket.

When finally connected up (the instructions could have been better) and powered up, the on screen menu will enable you to get going quickly.

Presuming that you have selected a viewdata type service the procedure is as follows. Select option 0: LOG ON/OFF.

This takes you to a sub menu which allows you to auto log on, Manual log on or log off.

I may be wrong but it appeared that irrespective of whether manual or auto logging on was selected you still had to input your ID.

Once the description is made and you have input your ID, the screen clears and tells you to phone the computer.

Using the telephone dial up and wait for the tone. Once heard throw the on/off line switch down and after a few seconds contact should be made. Once the line has been seized you should be able to put down your receiver but on my set-up if I did that the line was disconnected. This left me with an open line to which all sorts of noise pollution (mainly my 3 children) had unrestricted access. I suspect though that it may be a fault at my end rather than with the modem.

The other options available from the power up menu are:

TERMINAL: This allows you to return to viewdata service after performing a function such as print frame.

SAVE FRAME: This enables you to save a frame to tape or disc and is useful on pages such as timetables and so on.

VIEW FRAME: From here you can load up a frame that has been previously saved to tape/disc.

PRINT FRAME: Problems here but I must tread carefully. I could not get a printout on my Canon/Commprint set up which emulates an MPS801 and from mailboxes I have had I know quite a few people have been able to dump on an MPS801. It would appear that it is set up to print only onto a centronics printer connected through the user port but I have a feeling that in the distant past I did get a mailbox from someone who said you could dump to the 801. If you are out there and reading this please get in touch again as the method used would be worth putting in the mag.

DOWNLOADER: This allows you to download the hopelessly small amount of software available on Prestel/Micronet. What is there appears rather dated and unexciting, however for the first time I did find that downloading results were consistently good. There is a check on each frame and up to give attempts are made to download the frame before the software aborts. I only had one failure in 19 loads.

MAILBOX: With this option you can prepare, offline, mailbox messages to be used with either Prestel or user to user. This saves telephone time and so keeps the phone bills down. When preparing a mbx to use with Prestel bare in mind the size of the page you will be sending on as it is easy to overtype and find part of your message will not fit the page.

USER COMMS: This allows you to connect up with other Prism users and

MADNESS



either send/receive files, send receive mailboxes or enter CHAT MODE. Chat mode allows you to 'talk' directly using the keyboard. I find though that that little used option called 'speech' is often quicker and more effective.

I only had chance to have a very quick run through user to user. The results were not very good but I suspect that the problems lay with unclean telephone lines not in lthe modem itself.

In conclusion

For the money the Prism package with software seems a good buy. It is a shame that it does not support 300/300 out one cannot have everything.

I found it easy to use with only a couple of small niggles.

There is a good second hand market in modems and so I feel that this would be a particularly good buy for the first time user. You would be able to check out communications and see if you liked it and then either sell it to upgrade or sell it and pack up.

Miracle Technology

This is the one for anybody who loves switches and L.E.D's The Miracle Technology modem certainly looks the part. Three Rotary Dials and 5 l.e.d's and two tone lettering makes this look as if it will do everything. Well, it comes very close.

This one does so much that some of the options are restricted by a stop on the switch in order for it to comply with current Telecom approval specifications.

Now, I say it seems to do nearly anything, in practice my review model did virtually nothing. Why? Well when you buy the Modem that is practically all you get. On its own it could not do anything except a self test. The thing you would need to buy to get everything going is communications software.

Supplied with the Modem is an RS232 interface which plugs into the user port of the 64 and into the modem. It was a shame that the user port plug did not have a straight through socket as many people now have Centronics printers connected via the user port so as it stands there would be a certain amount of plugging/ unplugging involved.

The Features

On the HARDWARE side the WS2000 offers the following.
300 bit/s Full Duplex
600 bit/s Half Duplex
1200/75 bit/s Viewdata
75/1200 bit/s Viewdata host
And if you are outside the restrictions of BT there is also BELL 103/202 Compatability.

There should be something there that most of you will want, I particularly like the 300/300 option. As I said on its own it is virtually useless and you will need to get terminal software in order to make use of your Modem.

I could see that if you were new to this type of thing you could end up disappointed, and somewhat poorer, if the need for comms software was not appreciated at the time of purchase. This could have been made clearer. I may be wrong but a message passed to me indicated that in future the modem may be supplied with fairly basic comms software so you could at least get going from the start.

I understand that one piece of software that goes together well with the WS200 is the Comms software from PSI. Unfortunately this did not arrive in time for it to be used in conjunction with this modem which would have made it a more meaningful review, however if that software is as good as rumour has it then it may be worth getting it into a later edition of the magazine.

My conclusions on the WS2000 have to be drawn from the information in the manual.

It seems to offer most things and would, with the right software be a versatile tool. The documentation is fairly comprehensive but I found that it was heavy going the first time through. Of course once connected to good software most of the Modems manual becomes redundant as options will be controlled through software.

The most unsatisfactory conclusion is that I think you would enjoy using the WS2000, but be warned of the extra hidden costs of Comms software.

Tandata TM200

Could this be the cream of the Modems I had for review?

It did not seem quite as versatile as the WS2000 on options but where this set up scored was with the cartridge based software.

The TM200 is exactly the opposite to the WS2000. Where the WS2000 has masses of switches and writing the TM2000 has nothing. It sits by the computer, like a mysterious monolith giving no indication of what it is.

In use though it is different. It will handle 1200/75, 75/1200 and 300/300 allowing you to choose parity and so on. All under software control.

Little can be said about the Modem itself except that it is impressively silent. You could easily forget it.

Inside there is what appears to be non-volatile RAM which remembers your password and ID (optional) and stores a



list of your most often used computer numbers. This saves much time and makes it very, very easy to use. No setting up just plug in and go.

No manual intervention is required to seize the line, the modem does all that. When you have dialled up you can hear through it's inbuilt speaker the dialling tone etc. When you have the tone it shuts off and you are away.

The cartridge

The cartridge is the brain behind the button. Plug in and the master menu is presented.

The options are as follows.

1. MODEM MENU
This takes you to the dial menu. After programming the numbers in when first used you select the computer you wish to call and the modem auto dials.
2. SELECT OUTPUT DEVICE
With this you configure the disc/printer type you have. This would need to be done each time with a non-standard set up but with a 1541 as device 8 and a Commodore type printer this option can be ignored.
3. SELECT DISC FRAME
This allows you to load from tape or disc a previously stored frame.
4. DISC FUNCTIONS
From here you can display a disc directory, format discs, scratch files and so on.
5. LOAD AUXILLARY PACK
You can load external programs designed to run with the TANDATA cartridge. These may give you extra functions.
6. EDIT MAILBOX
Like the Prism modem this allows you to prepare or edit stored mailboxes in order to save on line time. Again the same problem of text longer than a page can be arise.
7. EDIT MEMORY
This is almost the same as EDIT MAILBOX except that the one to be edited is resident only in memory and not stored.
8. TERMINAL MODE
With this option you can enter 300/300 mode. When connected to your BB or view data service from terminal mode the screen will scroll and it is possible to direct output straight to the printer as well as the screen.

When you are connected to a service there is a second menu which is called the ON LINE MENU

From here you can

a. SAVE CURRENT FRAME
b. GO-OFF LINE (LOG OFF)
c. SEND ASCII FILE
d. SEND BASIC FILE
e. TOGGLE CALL TIMER. This is a built in call timer which is displayed on the bottom line of the screen. I find it very useful but it is surprising how fast the minutes click away when you are on line. For a change this clock seems quite accurate.
f. SEND EDITED FILE. This allows you to send a disc/tape based frame.
g. SEND FRAME FROM MEMORY This allows you to send the file edited in memory.
h. PRINT FRAME
i. REVEAL With this option you can display hidden Prestel data. e.g. Answers to quiz questions and so on.
j. DOWNLOAD TELESOFTWARE I had little success with this one. The Tandata system requires the use of a tokenising program and repeated attempts only resulted in failure. I shall be trying again soon.
k. SEND 800 This is effect a clear screen when on line to Prestel/Micronet.
1. CLEAR MENU This returns you to the point you were at prior to calling up this menu.

For me the Tandata was the best of the three with certain reservations.

The failure of telesoftware downloading was disappointing though there is so little on PTEL/M'net at the moment I can live without it. The next is the price. The TM200 must be in the luxury class, but you get what you pay for and to me it does seem a fair price for a piece of equipment with high specifications.

Having the cartridge based software and the auto-dial facility meant that I could get on line very quickly with no setting up and I found that an advantage as it is not unusual for me to log on to Prestel 3 or 4 times a day.

Which one

Any of them is all I can suggest. They are all good in their different departments. Much depends on the amount you can afford to spend and your reasons for wanting to go on line.

Before I finish I think I should point out another Modem which was reviewed in an earlier issue. The PROTEK. Still the cheapest on the market. I still use the Protek regularly and find it reliable. The software could still do with rewriting as you can often end up with screens full of garbage but for the person who wants a cheap but effective Prestel terminal and one which is portable I still think it takes some beating.

Commodore also produce a modem for the 64. However this modem will only work in 1200/75 baud rate mode and has been covered numerous times in the magazine already. It is a good modem, it works well and you get a free subscription to Compunet with it. Next month we will be looking at Compunet and this modem in a greater depth.

If anybody has any snippets of information they think may help other readers or moans or gripes and so on, why not leave me a message on Prestel. My Prestel mbx number is 106434851. I will be pleased to hear from you.

COMMUNICAT

Tony Dennis explains exactly what you can do once you have bought a modem for your Commodore.

BUYING A MODEM GIVES THE Commodore 64 or Vic 20 user access to a wealth of information stored on mainframe computers all over the world. Sadly many enthusiasts soon become disillusioned because they cannot find any interesting telephone numbers to call. Here is a brief overview of the different telephone accessible services. Some are free – others charge for access time on the host computer. Start with the freebies and then decide what's worth paying for.

An obvious route for modem buffs is to subscribe to Prestel. It is run by British Telecom and was originally devised for people to access using their television sets. That is partly why the information is displayed in the form of colour pages, and virtually everything is done using the ten numerals plus ★(star) and (hash).

Taking out a subscription to Prestel gives access to a whole bunch of databases operated by travel agents, banks, building societies and manufacturers. There are areas devoted to the legal profession, financial information such as currency and share prices, and education as well as electronic mail. For most Commodore owners, though, it is well worth taking on a Prestel subscription through Micronet. This area is part of Prestel Microcomputing and therefore tailored to micro devotees. Micronet has all the latest micro news, reviews, free and chargeable software on-line waiting for downloading and, of course, games. Micronet also happens to be one of the most accessed parts of Prestel with a very loyal band of subscribers which number roughtly 15,000.

To get onto Micronet, a 1200/75 baud modem and Prestel compatible software are required. Don't worry because Micronet, Modem House, and Tandata among others sell all the necessary kit for Commodore owners. At most times at least one of these will throw in a free initial subscription to Micronet with the modem.

Commodore UK itself decided that its micro owners (and currently only 64 owners) should have a service of their own. Hence it got together with a computer bureau company called ADP and Compunet was born. This service can be accessed only by those who buy the Compunet modem (around £99). It uses pages of information like Prestel but the commands are much more sophisticated.

A list of commands is displayed at the bottom of the screen with a cursor highlighting one of them. The caller moves through the list of commands in either direction to get to the one required. It is known as a duck shoot as it is possible to rotate through the list until you arrive back at the starting point.

Compunet also has micro news, software available for downloading and electronic mail. The most popular part is MUD (multi-user Dungeons & Dragons) a game that originally started on Essex University's computer. It is very much like the board game with wizards, spells and treasure to find. The difference is that the players are actually on-line together and can be calling from any part of the country. Beware because the game is so addictive that enormous phone charges can easily be run up. Century who operate the game for Compunet also charge for playing time. Compunet is still in its infancy and thus a much smaller database than Micronet.

Both Micronet and Compunet can be accessed for the cost of a local call from most parts of the country. However, they both charge for subscriptions to their services. Luckily there are some services which don't. Some local authorities like Hackney have bought viewdata services which have free areas for the general public. They are fun to look at if you live in the area or – in the case of C-View – fancy a holiday in Rochford. The ITeCs (centres for deprived youngsters to learn computing skills) operate viewdata services, too. Each ITeC has its own special interests so these boards tend to be very different.

The ITeCs run software developed for the BBC known as Communitel. Since Communitel is now commercially available some enthusiasts have begun to use to run their own bulletin boards.

What are bulletin boards? They are messaging systems run on microcomputers by enthusiastic amateurs. When connected up to one, the caller is able to read and send messages to fellow micro enthusiasts on virtually any topic. It is possible to send private messages to an individual as well as public ones. Most boards have Special Interest Groups (SiGs) and there's nearly always one for Commodore users. The SiGs are particularly useful for asking other people's advice on micro problems, picking up the latest gossip and news on products, and even meeting other users! Most boards have free software for downloading and some of it will undoubtedly have been left there by other kind hearted Commodore users.

Micronet, Hackney and Communitel boards can all be accessed using Prestel software. There is also software available for the Compunet modem which allows it to be used with Prestel and even includes the special Micronet downloading protocols, but bulletin boards almost inevitably require what has come to be known as 'scrolling' software.

Instead of displaying information in the form of pages, services like bulletin boards send it in a continuous stream. Thus as the screen fills up, the first lines sent begin to scroll off the bottom. In order to access such services it is therefore necessary to have what is known as a terminal program. VIP terminal is the most popular of this type of software.

Bulletin boards also operate at a different baud rate (data transmission speed) from Prestel, Micronet, etc. For this a different modem will often be needed. The cheapest is from Intelnet which includes RS232 interface, modem and software all in the same unit. With such a modem another huge group of services can be accessed.

The most popular are electronics mail services like Telecom Gold, Easylink, One-to-One and Comet. They are mainly aimed at business users since they are a very cost effective method of sending telexes. Unlike bulletin boards, these electronic mail services can have hundreds of callers accessing the system

simulataneously.

Many companies which kept extensive databases on mainframe computers found that they could recoup some of the costs by making the information available on-line. In return for subscription fees which often run into hundreds of pounds it is possible to access the Financial Times service, Fintel or Hansard (Parliamentary) records kept by Scicon.

Most such information providers are not anxious for micro users to subscribe. The exception is an American company called Dialog which actively promotes a service for those with microcomputers. Known as Knowledge Index, it gives access to a whole range of databases which were considered to be of general interest. The cost is not too great but naturally the service is only available at off-peak times, when business subscribers are not calling. The most exciting thing about Knowledge Index is that British callers are actually connected via an international data switching network to Dialog's computers in the USA.

Normally it is not possible to access American services direct because their modems use the Bell standard not CCITT as in England. Thus the two really exciting services for micro users in the States, Compuserve and the Source are not readily available.

The way around this is to pay for a packet switching account (PSS) from British Telecom. Packet switching takes care of the difference in data protocols as well as costing less than dialling direct. To access Compuserve for example a British Commodore user would have to pay for the cost of a local call, the cost of PSS, plus subscription and connection charges on Compuserve itself. Not the thing for low income modem buffs!

North American bulletin boards use Bell frequencies but are not connected to any packet switching service. The user will thus need a modem which supports Bell frequencies. However, contact with our American cousins is possible via UK bulletin boards which switch to Bell frequencies at night like the Fido boards and Mailbox-80 Liverpool.

Luckily most of the rest of the world uses CCITT modems like us. Enthusiasts can therefore phone boards in Europe, South Africa and even Australia. Naturally, the phone bill will be vast.

Finally, modem buffs usually come around to wanting to run their own bulletin board so that instead of making outgoing calls, everybody phones them. Currently I know of only one system which allows Commodore 64 owners to host a board and that is Dial-a-match. Available in the USA, it is intended as a Lonely Hearts service. You would need to be very lonely though becuse when any substantial number of people has called, disk access time becomes intolerably slow.

Good hacking!

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COMPUTERS INCORPORATED
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00.00-08.00 Bell 103

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FORUM-80 SPA
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ABBS BATH
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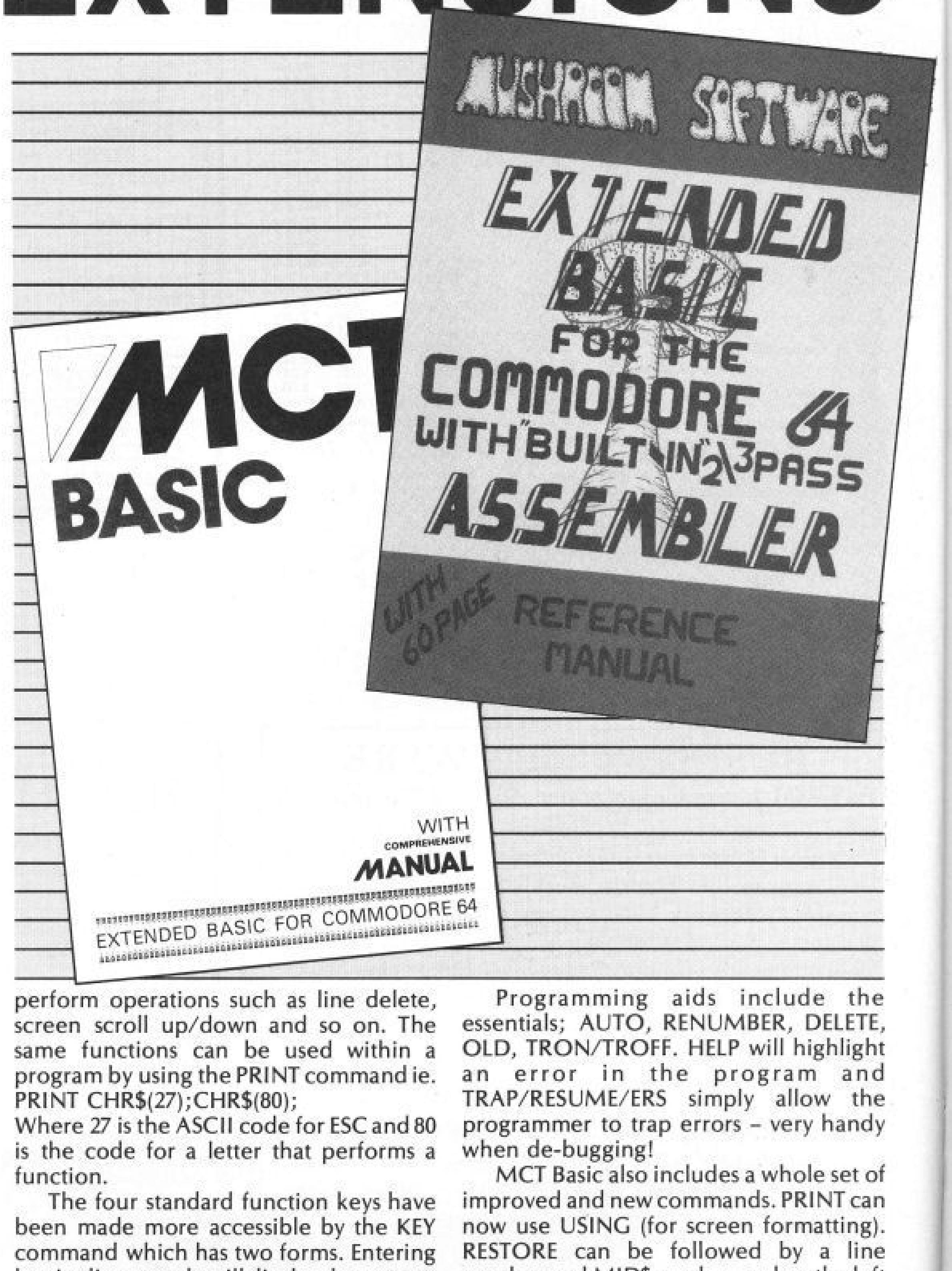
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Sysop: Rochford District Council
24 hours
Password: public

David Janda takes a look at some programs to enhance your 64.

BASIC EXTENSIONS



THERE IS A WHOLE RANGE OF BASIC language extensions available for the Commodore 64. You could be forgiven for asking why? The answer to that question is twofold. First, the Basic on the Commodore 64 is quite simply crummy. Taking into account that the 64 offers sprites, colour and sound it is amazing that Commodore didn't produce a Basic to utilise these features.

Secondly, the memory map of the Commodore 64 is very flexible. Many people refer to the 64 'as being a soft' machine. This is because it is very easy to re-configure the memory map, add additional commands and so on.

In this, the first part of a two part series, I shall be taking a look at some of the extended Basics available. Please note that it would take months to cover every one, so we have selected the most popular ones currently available.

MCT Basic — Micro Component Trading

One problem faced by software houses who produce this type of of package concerns the contents. What commands do you incorporate into a Basic extension package?

The producers of MCT Basic have overcome the problem in a novel way — they have added commands and functions that are compatible with BASIC V3.5. In other words, the extra goodies found on the C16 and Plus/4.

The MCT Basic package consists of a library-case style cassette holder with two cassettes and documentation. The first cassette (incorporating the Novaload system) holds the Basic extensions which include an assembler), whilst the second contains a screen painter which is written in MCT Basic. Documentation is supplied in the form of a 23 page booklet which describes (in small print) the operation of the commands in a concise manner.

The package includes extensions which cover three main areas. First there are the C16 and Plus/4 additions, next comes new Basic commands followed by programming aids.

The user-interface of the screen-editor has also been changed with the addition of 17 new keyboard functions. These functions are accessed by pressing the ESC key followed by a letter and perform operations such as line delete, screen scroll up/down and so on. The same functions can be used within a program by using the PRINT command ie. PRINT CHR$(27);CHR$(80);
Where 27 is the ASCII code for ESC and 80 is the code for a letter that performs a function.

The four standard function keys have been made more accessible by the KEY command which has two forms. Entering key in direct mode will display the current function key settings. KEY number, "string" will assign a string to the specified function key.

A fairly comprehensive selection of graphic commands are included in MCT Basic. Five graphic modes are made available with the GRAPHIC command.

The graphic commands include COLOUR, DRAW, CIRCLE, BOX, PAINT and so on. Eight sprite commands are included.

Programming aids include the essentials; AUTO, RENUMBER, DELETE, OLD, TRON/TROFF. HELP will highlight an error in the program and TRAP/RESUME/ERS simply allow the programmer to trap errors – very handy when de-bugging!

MCT Basic also includes a whole set of improved and new commands. PRINT can now use USING (for screen formatting). RESTORE can be followed by a line number and MID$ can be used on the left of an argument. Added control structures include ELSE, DO...LOOP, DO UNTIL...LOOP and DO WHILE...LOOP.

It's a great pity that this package doesn't include a facility to incorporate the extensions within your own program ie. without the use of the main MCT Basic resident. As it stands, MCT Basic provides a well balanced selection of commands and functions which are both useful and functional.

EXTENDED BASIC — Mushroom Software

When I first looked at the instruction manual for Extended Basic, I thought I was looking at the BBC User Guide! The package incorporates some commands found in BBC Basic including an in-line three pass assembler.

Extended Basic from Mushroom software includes 47 new commands that are divided into 13 groups. As mentioned before, a three pass assembler is incorporated within Extended Basic, and in my opinion the package is worth buying for that alone. (Machine code fans may be interested to know that an updated version of the assembler can be purchased separately for £5.95).

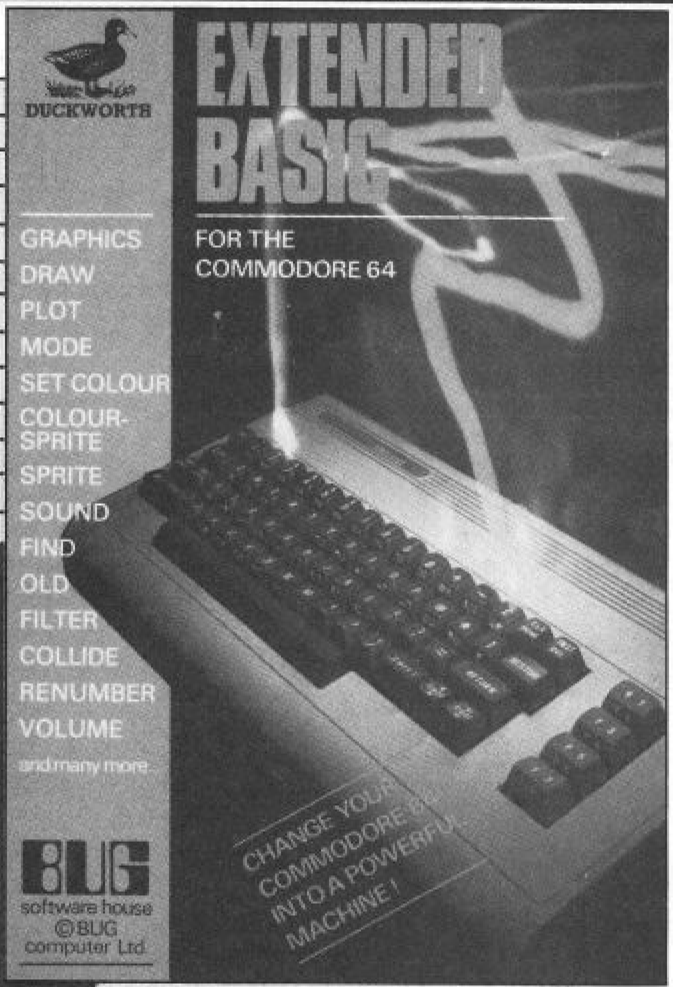
The package includes quite a few commands, and it is not recommended for the absolute beginner. I can understand why, as many commands are related with each other in some way - the sprite commands being example.

Although Extended Basic covers a variety of programming requirements, graphics and sprites are the main theme of the package.

The graphic commands merely deal with the colour settings for the paper, ink and so on. The MODE command selects the video mode and is configured as shown in table 2.

The COLOUR command within the hires group will explain MODE1 a little better. Basically four colours are available in MODE1. COLOUR pa,ph is used to select a physical (ph) colour from the pallet of 16 and assign it to the paint (pa). To actually select a colour to be used in high-res drawing the PAINT command is used. Paint also has a second parameter which selects one of five boolean operations to be performed on the drawing.

Extended Basic is quite a complex package that offers numerous commands. Yet I believe it is over-complex in some areas, and also feel that the operation of some of the commands could have been implemented in a more easy to use manner.





EXTENDED BASIC — Duckworth/Bug

A major problem associated with extended Basics is complexity. A software house will try and do better than the next one by providing more and more sophisticated commands and functions. For the novice programmer who has just learnt Basic but would like a few more commands confusion is the order of the day.

Therefore, I was relieved to use Extended Basic from Duckworth/Bug software. This cassette based package offers the user 27 new commands that either add new features, or replace complex POKEs.

The commands provided in this version of Extended Basic are simple but practical. One command is used to select the screen mode whilst another selects the graphic mode.

Colour control is achieved with just one command - COLOUR. Colour is followed by eight parameters which correspond to the colour registers with the 64'.

Graphic functions include a basic PLOT command for use in both modes. The DRAW command is followed by two or more sets of co-ordinates, and draws a line between the points specified. POINT x,y,v will check the screen location pointed to by x and y for a colour whose number is held in variable v. In other words, it's a function that would be used as an argument within an IF statement.

To round-off the graphics side of things, TYPE will display a string of characters in both graphic modes. The user specifies the x and y co-ordinated as well as the height and width (in pixels) of each character.

I was highly impressed with the way the sprite commands were incorporated in this package. The sprite shape is defined by using the SHAPE command. The user enters SHAPE on one line, and the following 21 lines are used to define the shape itself. Each line starts with a double-quote and wherever the foreground is to appear a '1' is inserted. The background is represented by a '0' and nothing, by nothing! Using this method enables you to instantly recognise the shape of a sprite when looking at the program listing.

SPRITE n is followed by severl parameters which set the mode, colour and so on. The next two commands are very handy! SMOVE n,x,y will move sprite n to co-ordinates x y whilst COLLIDE n,v which check to see if sprite n has collided with another sprite or background. The amount of the screen to be checked (in % terms) is specified by v.

It was a real pleasure using this Extended Basic. The commands are just right for the less experienced programmer and I would also recommend the package to the more experienced who wish to get some quick results!

BASIC LIGHTNING — Oasis Software

Basic Lightning from Oasis software is the most comprehensive Basic extension I have used on the Commodore 64. Adapted from White Lightning — a FORTH based package - Basic Lightning offers over 150 commands and functions. As well as the added features, Basic Lightning allows for multi-tasking with up to five parts of a program running at the same time.

The commands cover three main areas; graphics, sound and structured programming. Oasis claim that it is possible to produce commercial quality software package, and in general I agree.

The planned addition of a compiler later this year will mean that programs developed with this package will run independant of the main package.

Rather than attempt to describe the vast numbers of commands available in this package (just have a look at the sound commands!), I will describe some of the structured programming features it offers. Even a games programmer needs good programming structures to write fast and efficient code, and this is often overlooked by other extension writers. Thankfully, this is not the case with Basic Lightning.

The first addition is the ELSE construct. Thus enabling you to say IF SCORE=1000 THEN PRINT "GOOD" ELSE PRINT "KEEP ON TRYING!".

As you can see, a very handy addition. Not only that, but it is possible to 'nest' ELSE's. Another form of the IF...THEN... ELSE construct is as follows:

```
10 INPUT A
20 CIF A=0
30 PRINT "ERROR, TRY AGAIN!"
40 GOTO 10
50 CELSE
60 PRINT "NUMBER ACCEPTED"
70 A=A5A
80 CEND
```

Basically, CIF...CELSE...CEND provide a means where the 'IF' construct can be spread out over several lines. Notice the automatic indentation for readability.

REPEAT...UNTIL is useful for setting up a loop when you don't know how many times a group of statements are to be repeated. This is because REPEAT... UNTIL works on a condition. A variation is the WHILE...WEND construct. The difference here is that the test is performed at the beginning of the loop.

The next item to consider is the CASE statement. Originating from the Pascal programming language, it offers a flexible means of branching given a true condition. An example from the manual demonstrates this:

```
10 INPUT A
20 CASE A
30 OF 3 : PRINT "Three French hens."
40 OF 2,3 : PRINT "Two turtle doves."
50 OF 1,2,3 : PRINT "And a partridge in a pear tree."
```

...And so on.

Finally, those of you who are jealous of BBC Basics' procedures need not be jealous any more! Procedures are fully supported within Basic Lightning. Parameters may be passed to and from them, local variables can be declared even whole arrays can be passed as parameters.

Basic Lightning is quite simply excellent. But be warned, it is a complex package that takes some time to understand and appreciate!

Summary

The packages I have looked at this month are all quite good. But there are a couple of points worth bearing in mind. First, you will find it a tough job finding a package that incorporates all the features that you want. Secondly, big is not necessarily beautiful. I wouldn't, for example, recommend Basic Lightning to the absolute beginner!

Table 1 - Graphic modes supported in MCT Basic

GRAPHIC0	column by 25 line text mode
GRAPHIC1	320 × 200 pixel high-res mode
GRAPHIC2	As for GRAPHIC1 but with five lines of text at the bottom of screen
GRAPHIC3	160 × 200 pixel multi-colour high-res mode
GRAPHIC4	As for GRAPHIC3 but with five lines of text at the bottom of screen

Table 2 - Graphic modes supported in Mushrooms' Basic

MODE0	320 × 200 highres-graphic
MODE1	160 × 200 high-res four colour
MODE2	Extended colour text mode
MODE3	Multicolour text mode
MODE4	Standard text mode ie. power-on mode

Table 3 - A breakdown of commands used in Mushrooms' Basic

5 Utility	AUTO, DEFKEY, DELETE, OLD, RENUM
5 Graphic	BORDER, CLS, INK, MODE, PAPER
4 Assembler	CALL, CLRDATA, FREECODE, FREEDATA
9 Hires	CLG, COLOUR, DRAW, FILL, MOVE, PAINT, PLOT, SETMID, TRIN
5 Sprite	DEFMOB, MOBCOL, MOBFIELD, MOBPOS, SPRITE
3 Procedure	DEFPROC, ENDPROC, PROC
4 Sound	DEFVOC, MASTER, SID, SOUND
3 Disc	DIR, DISC, REPORT
3 Structure	ELSE, REPEAT, UNTIL
2 I/O	LOADMEM, SAVEMEM
2 Other	PAUSE, RESTORE
1 Misc	OPT
1 Graphic/printer	COPY

Table 4 - Sound commands available in Basic Lightning

VOLUME	Sets master volume
PRQ	Sets a frequency to specified voice
ADSR	Used to set envelope shape
MUSIC	Sets the length of a note
SAW	Selects sawtooth waveform for a voice
TRI	Selects triangle waves
NOISE	Selects noise
PULSE	Produces a square wave
FILTER	Affects the timbre of a sound
PASS	Selects operation of FILTER
CUTOFF	Selects cut-off frequency
RESONANCE	Makes the filter resonant
RING	Introduces ring modulation
SYNC	Synchronises voices

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Have you ever wanted to spend some time with a World famous pop-star? You have? Well now's your chance to win some time with Paul McCartney.

More and more games are appearing on the market that are based around television series or films. Give My Regards to Broadstreet from Argus Press Software being an excellent example of how a good game can be made from a film plot.

Both game and film are based around Paul McCartney who is trying to find some missing sections of the master tape for his latest album. In the game you play the part of Mr McCartney and must dash around an authentic map of London trying to locate your friends to see if they have the missing pieces.

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COMPETITIO

What to do

Firstly you will need a copy of the computer game as all of the competition questions need quite a bit of familiarity with the game in order to answer them correctly.

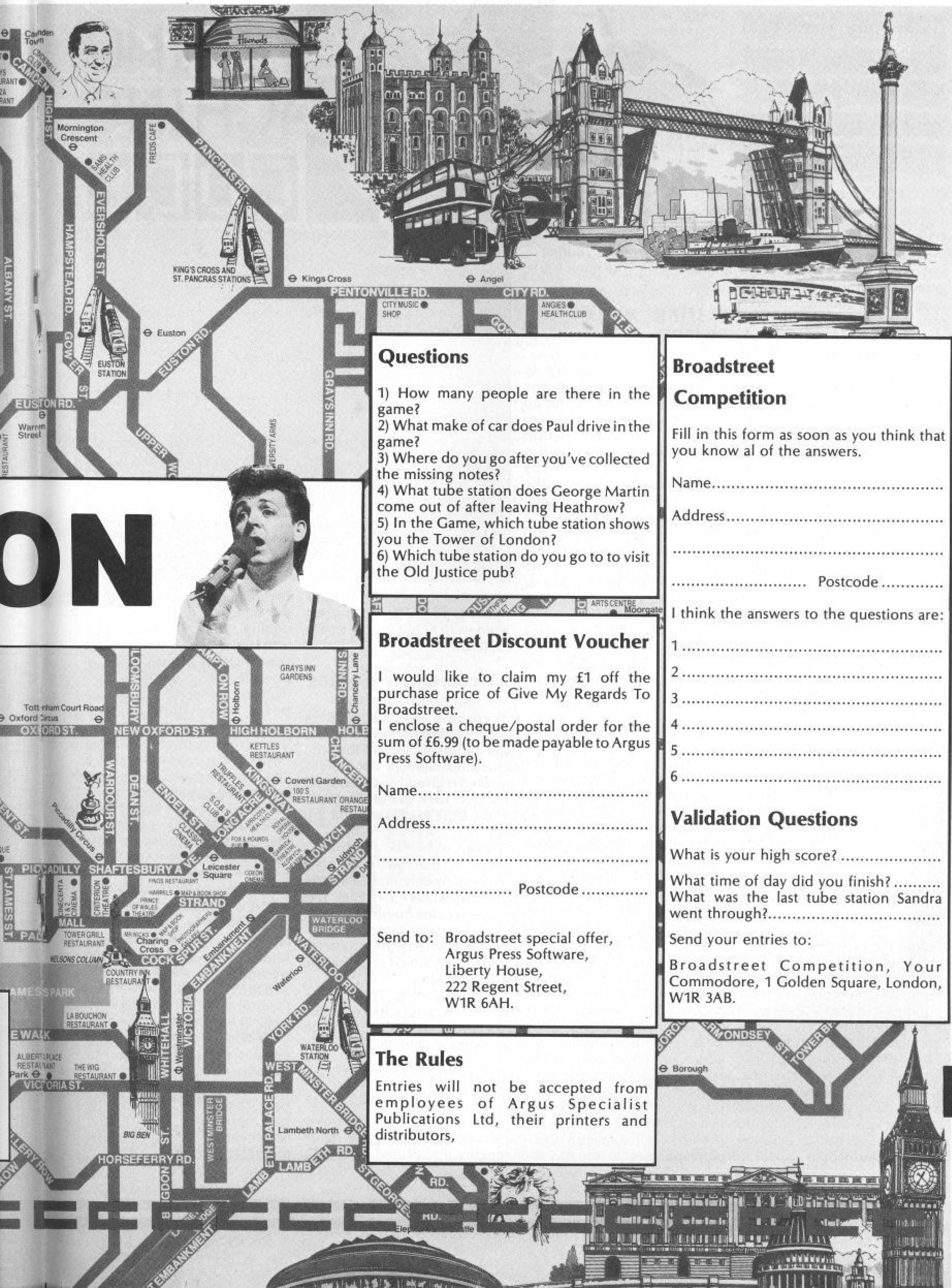
If you don't already own a copy of this game we have included a voucher that will give you £1 off of the game. All orders are to be sent to Argus Press Software at the address shown on the discount voucher.

Secondly you must sit down and play the game until you are sure that you can answer all the questions correctly.

Then fill in the competition entry form with your answers and the validation questions in case there is a tie.

Complete the competition entry form, not forgetting the validation questions, and send your entry to Broadstreet Competition, Your Commodore, 1 Golden Square, London W1R 3AB. The closing date of the competition is 9th August.





Questions

1) How many people are there in the game?
2) What make of car does Paul drive in the game?
3) Where do you go after you've collected the missing notes?
4) What tube station does George Martin come out of after leaving Heathrow?
5) In the Game, which tube station shows you the Tower of London?
6) Which tube station do you go to to visit the Old Justice pub?

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5 ....
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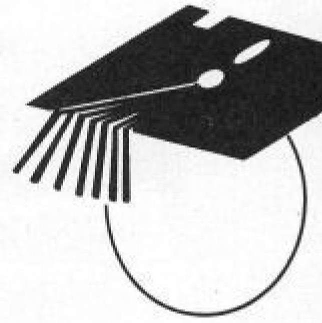
What is your high score? ....

What time of day did you finish? ....
What was the last tube station Sandra went through?..................................

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MASTERING MACHINE CODE



Make your graphics programming easier with these helpful routines from AP and DJ Stephenson

SEVEN ROUTINES ARE PRESENTED here and are given in assembly language form in Program 11.1 All the routines are used by the function plotter program described in this months BASIC FACTS article. A hex loader program, with the object code in DATA statements, is given and should ease the task of typing in the program. However, if you wish to modify or improve the routines then the Assembly language listing is the best course of action. Please make sure you SAVE the source code on tape before attempting to execute any code. A simple typing error or omission will almost certainly cause the system to crash.

The routines

Programming high resolution graphics, using standard CBM64 BASIC, can be rather tedious. In addition the execution speed can be painfully slow. A few simply machine code routines, of the type given in this article, are very useful in areas such as graph plotting especially if they can be called from BASIC. Figure 1 lists the available routines.

Clearing the bit map area

Before we even start using hi-res graphics, it is necessary to clear the *bit map*, an 8000 byte area of memory, corresponding to a graphics screen of 320 by 200 pixels. This area is normally placed at address $2000 (B152 decimal) but can easily be repositioned. Clearing the bit map with a series of POKEs from BASIC would take several seconds to execute whereas a machine code version would appear to execute instantaneously. An example of such a routine is that of CLEARMAP (lines 930 to 1090).

Setting up screen memory

Two colours are available in high resolution mode. A one byte number is used to set up the two colours that are available. The upper nybble specifies the colour (coded 0 to 15) of any pixel represented by a binary one in the bit map. The lower nybble is the colour code of any pixel represented by a binary zero. The desired combination of colours are POKEd into the location labelled SCRCOL ($FE hex or 254 decimal) prior to a call to INIT or SCRFILL. For example, POKE254,7 would specify black graphics on a yellow background. Refer to the program breakdown for details of the coding.

The INIT ROUTINE

This routine sets up all the default bit map addresses and screen memory and calls the CLEARMAP and SCRFILL routines. It is also responsible for setting up the raster interrupt SERVICE routine by resetting the interrupt IRQ vector. By using raster interrupt techniques, the screen can be split between high resolution graphics and a text window at the bottom of the screen. Before calling the INIT routine with SYS49152 it is necessary to set up a few locations. Firstly, the colour information needs to be present in location $FE (254). For testing purposes try POKE254,7 as described above. Secondly, the position of the screen split needs to be set up in location $02 (2 decimal). This should be in the range 51 to 251 corresponding to the top and bottom of the visible screen. A figure of $D8 (216) leaves a text window of about four lines. Try POKE2,216.

1. CLEARMAP: a fast routine for clearing the bit map area of memory.
2. SCRFILL, a routine for setting up the screen memory area with the colour information needed by the VIC II chip.
3. PLOTBIT, A routine for lighting up any individual pixel from supplied X,Y screen coordinates.
4. VLIN, a routine for drawing a vertical line of a chosen length.
5. HLIN, a routine for drawing a horizontal line of chosen length.
6. SERVICE, this is the interrupt routine which handles split screen text and graphics windows.
7. INIT, an initialisation routine for the raster interrupt sequence. It also calls on the subroutines CLEARMAP and SCRFILL.

XY coordinate plotting

According to the CBM64 programmers reference guide, the address in which the character memory dot (X,Y) is located is given by: BYTE=BASE + ROW*320 + CHAR*8 + LINE. POKE BYTE,PEEK(BYTE) OR 2 ↑ BIT

where,

BASE = the bit map start address. By default, $2000 (8192 decimal) ROW = INT(Y/8). The character row number (0 to 24) containing the Y coordinate.

LINE = (Y AND 8). The character line (0 to 7) which contains the Y coordinate.

CHAR = INT(X/8). The position of the character within the row which contains the X coordinate (0 to 39).

Rearranging the equations

Obviously, the above calculations would be fairly lengthy if executed in BASIC. Fortunately, we can rearrange the equation so that machine coding can be performed efficiently. We need to expand the equation so that, as far as possible, all multipliers and divisors are exact powers of two. This simplifies all multiplication and division to simply shifting bits to the left or right respectively. The rearrangement can be performed as follows:

ADDRESS = BASE + ROW*320 + LINE + CHAR*8

This can be expanded to,

ADDRESS = BASE + 40*(ROW*8) + LINE + CHAR*8

ADDRESS = BASE + 32*(ROW*$) + LINE + CHAR*8

By substituting the equations for ROW, LINE and CHAR and setting BASE at default $2000 we finally arrive at:

ADDRESS = $2000 + 32*(INT (Y/8)*8) + 8*(INT(Y/8)*8) + (Y AND 7) + 8*INT(X/8)

It is now relatively easy to convert the final equation to machine code. All that INT(Y/8) entails is shifting Y right three times, thus dividing by eight and losing the remainder (the three least significant bits of Y).

Program Listing

```
10 033C          !HI-RESOLUTION GRAPHICS UTILITY
20 033C          !WITH SPLIT SCREEN TEXT WINDOW
30 033C                  XCOORD      =   $FB
40 033C                  YCOORD      =   $FD
50 033C                  SCRCOL      =   $FE
60 033C                  BMPAGE      =   $FF
70 033C                  MASK        =   $59
80 033C                  LOC         =   $5A
90 033C                  STORE       =   $5C
100 033C                 SCRPAGE     =   $C200
110 033C                 LENGTH      =   $C201
120 033C                 SCNKEY      =   $FF9F
130 033C                 GETIN       =   $FFE4
140 033C                 CHROUT      =   $FFD2
150 033C                 SPLIT       =   $02
160 C000                 *=$C000
170 C000                 !
180 C000 2010C0                      JSR INIT
190 C003 60                          RTS
200 C004 204EC0                      JSR PLOTBIT
210 C007 60                          RTS
220 C008 20D1C0                      JSR VLIN
230 C00B 60                          RTS
240 C00C 20DCC0                      JSR HLIN
250 C00F 60                          RTS
260 C010                 !
270 C010 78              INIT        SEI
280 C011 A993                        LDA #$93
290 C013 20D2FF                      JSR CHROUT
300 C016 A920                        LDA #$20
310 C018 85FF                        STA BMPAGE
320 C01A A904                        LDA #4
330 C01C 8D00C2                      STA SCRPAGE
340 C01F 2090C0                      JSR CLEARMAP
350 C022 20AEC0                      JSR SCRFILL
360 C025 AD0EDC                      LDA $DC0E
370 C028 29FE                        AND #$FE
380 C02A 8D0EDC                      STA $DC0E
390 C02D A9FE                        LDA #<SERVICE
400 C02F 8D1403                      STA $314
410 C032 A9C0                        LDA #>SERVICE
420 C034 8D1503                      STA $315
430 C037 AD1AD0                      LDA $D01A
440 C03A 0901                        ORA #1
450 C03C 8D1AD0                      STA $D01A
460 C03F A502                        LDA SPLIT
470 C041 8D12D0                      STA $D012
480 C044 AD11D0                      LDA $D011
490 C047 297F                        AND #$7F
500 C049 8D11D0                      STA $D011
510 C04C 58                          CLI
520 C04D 60                          RTS
530 C04E                 !
540 C04E A5FB            PLOTBIT     LDA XCOORD
550 C050 2907                        AND #7
560 C052 AA                          TAX
570 C053 38                          SEC
580 C054 A900                        LDA #0
590 C056 855A                        STA LOC
600 C058 6A              SHIFT       ROR A
610 C059 CA                          DEX
620 C05A 10FC                        BPL SHIFT
630 C05C 8559                        STA MASK
640 C05E A5FB                        LDA XCOORD
650 C060 29F8                        AND #$F8
660 C062 855C                        STA STORE
670 C064 A5FD                        LDA YCOORD
```

Multiplying by 8 is then achieved by shifting the result left three times. However, there is an even simpler way of calculating INT(Y/8)*8. In effect, the above two operations simply clear the 3 least significant bits of Y. Therefore masking out the three least significant bits of Y with AND $F8 will produce the same result. Similarly, the INT(X/8)*8 term can be coded by ANDing the lower byte of X with $FB. Remember that the specified X coordinate will occupy two bytes in this graphics mode (0 to 319). If the X coordinate is stored in locations labelled XCOORD and XCOORD+1 the following code should temporarily store the low byte result in the location STORE.

LDA XCOORD
AND $FB
STA STORE

We are even more fortunate in coding the term 32*(INT(Y/8)*8). This simplifies even further because logically shifting Y right three times and storing it as the high byte of the result is all that is needed. However, this is only possible because the 3 least significant bits of Y are redundant. If the Y coordinate is stored in the location labelled YCOORD it follows that the result of 32*(INT(Y/8)*8) can always be stored in the location LOC+1 the low byte is always zero. The process can be coded as follows:

LDA #0
LDA LOC
LDA YCOORD
LSR A
LSR
XXX
LSR A
LSR A
STA LOC+1

Two further shifts right of the 32*(INT(Y/8)*8) result (dividing two twice) gives 8*(INT(Y/8)*8). The high byte of the former will still be present in the accumulator, the low byte is always zero. This can be coded as,

LSR A
ROR LOC
LSR A
ROR LOC

Notice that LOC is not strictly necessary in the result of the previous operation since it is always zero. However, by reusing it for future calcula-

tions we save instructions and memory locations.

The remaining (Y AND 7) term is easy to code, the result will be in the accumulator:

LDA YCOORD
AND # 7

If the page address of the bit map base address ($20) is present in the location labelled BMPAGE, then the final addition of all the terms gives the address of the location in which the relevant bit is to be set. The corresponding code in Program 11.1 is similar but has been messed around a bit for efficiency.

Finally, in order to select the individual bit corresponding to the required pixel we need a mask byte to OR with the address found above. The mask can be constructed by setting the carry and rotating right the required number of times. The loop counter can be initialised from the three least significant bits of XCOORD. The following is one way to perform this:

```
LDA XCOORD
AND # 7
TAX
SEC
LDA # 0
SHIFT ROR A
DEX
BPL SHIFT
STA MASK
```

The mask is used in the following way to set the required bit.

```
LDY # 0
LDA (LOC),Y
ORA MASK
STA (LOC),Y
```

Using the PLOTBIT routine

Prior to calling PLOTBIT, it is necessary to call the INIT routine with SYS49152 (remember to set the screen split and colour locations first) and set up the following locations with legal values. The bracketed terms are the decimal equivalent for POKE statements from BASIC. The X coordinate must be in the range 0 to 199.

These are:

X coordinate low byte. Location $FB (251).

X coordinate high byte. Location $FC (252).

Y coordinate. Location $FD (253).

Program Listing (cont.)

```
680 C066 4A                  LSR A
690 C067 4A                  LSR A
700 C068 4A                  LSR A
710 C069 855B                STA LOC+1
720 C06B 4A                  LSR A
730 C06C 665A                ROR LOC
740 C06E 4A                  LSR A
750 C06F 665A                ROR LOC
760 C071 655B                ADC LOC+1
770 C073 855B                STA LOC+1
780 C075 A5FD                LDA YCOORD
790 C077 2907                AND #7
800 C079 655A                ADC LOC
810 C07B 655C                ADC STORE
820 C07D 855A                STA LOC
830 C07F A55B                LDA LOC+1
840 C081 65FC                ADC XCOORD+1
850 C083 65FF                ADC BMPAGE
860 C085 855B                STA LOC+1
870 C087 A000                LDY #0
880 C089 B15A                LDA (LOC),Y
890 C08B 0559                ORA MASK
900 C08D 915A                STA (LOC),Y
910 C08F 60                  RTS
920 C090            !
930 C090 A5FF       CLEARMAP LDA BMPAGE
940 C092 855D                STA STORE+1
950 C094 A900                LDA #0
960 C096 855C                STA STORE
970 C098 A21F                LDX #$1F
980 C09A A000       LOOP     LDY #0
990 C09C 915C       LOOP2    STA (STORE),Y
1000 C09E 88                 DEY
1010 C09F D0FB               BNE LOOP2
1020 C0A1 E65D               INC STORE+1
1030 C0A3 CA                 DEX
1040 C0A4 D0F4               BNE LOOP
1050 C0A6 A03F               LDY #$3F
1060 C0A8 915C      LOOP3    STA (STORE),Y
1070 C0AA 88                 DEY
1080 C0AB 10FB               BPL LOOP3
1090 C0AD 60                 RTS
1100 C0AE           !
1110 C0AE A900      SCRFILL  LDA #0
1120 C0B0 855C               STA STORE
1130 C0B2 AD00C2             LDA SCRPAGE
1140 C0B5 855D               STA STORE+1
1150 C0B7 A5FE               LDA SCRCOL
1160 C0B9 A203               LDX #3
1170 C0BB A000      BLOCK    LDY #0
1180 C0BD 915C      CYCLE    STA (STORE),Y
1190 C0BF 88                 DEY
1200 C0C0 D0FB               BNE CYCLE
1210 C0C2 E65D               INC STORE+1
1220 C0C4 CA                 DEX
1230 C0C5 D0F4               BNE BLOCK
1240 C0C7 915C               STA (STORE),Y
1250 C0C9 A0E7               LDY #$E7
1260 C0CB 915C      NEXT     STA (STORE),Y
1270 C0CD 88                 DEY
1280 C0CE D0FB               BNE NEXT
1290 C0D0 60                 RTS
1300 C0D1           !
1310 C0D1 204EC0    VLIN     JSR PLOTBIT
1320 C0D4 E6FD               INC YCOORD
1330 C0D6 CE01C2             DEC LENGTH
1340 C0D9 D0F6               BNE VLIN
```

Program Listing (cont.)

```
1350 C0DB 60                 RTS
1360 C0DC          !
1370 C0DC 204EC0 HLIN        JSR PLOTBIT
1380 C0DF E6FB               INC XCOORD
1390 C0E1 D002               BNE SKIP
1400 C0E3 E6FC               INC XCOORD+1
1410 C0E5 38     SKIP        SEC
1420 C0E6 AD01C2             LDA LENGTH
1430 C0E9 E901               SBC #1
1440 C0EB 8D01C2             STA LENGTH
1450 C0EE B003               BCS SKIP2
1460 C0F0 CE02C2             DEC LENGTH+1
1470 C0F3 AD01C2 SKIP2       LDA LENGTH
1480 C0F6 D0E4               BNE HLIN
1490 C0F8 AD02C2             LDA LENGTH+1
1500 C0FB D0DF               BNE HLIN
1510 C0FD 60                 RTS
1520 C0FE          !
1530 C0FE AD19D0 SERVICE     LDA $D019
1540 C101 2901               AND #1
1550 C103 F036               BEQ EXIT
1560 C105 8D19D0             STA $D019
1570 C108 AD12D0             LDA $D012
1580 C10B C910               CMP #$10
1590 C10D 9017               BCC HIRES
1600 C10F AD18D0 TEXT        LDA $D018
1610 C112 29F7               AND #$F7
1620 C114 8D18D0             STA $D018
1630 C117 AD11D0             LDA $D011
1640 C11A 29DF               AND #$DF
1650 C11C 8D11D0             STA $D011
1660 C11F A900               LDA #0
1670 C121 8D12D0             STA $D012
1680 C124 F015               BEQ EXIT
1690 C126 AD18D0 HIRES       LDA $D018
1700 C129 0908               ORA #8
1710 C12B 8D18D0             STA $D018
1720 C12E AD11D0             LDA $D011
1730 C131 0920               ORA #$20
1740 C133 8D11D0             STA $D011
1750 C136 A502               LDA SPLIT
1760 C138 8D12D0             STA $D012
1770 C13B 209FFF EXIT        JSR SCNKEY
1780 C13E 20E4FF             JSR GETIN
1790 C141 C900               CMP #0
1800 C143 F023               BEQ OVER
1810 C145 78                 SEI
1820 C146 A931               LDA #$31
1830 C148 8D1403             STA $314
1840 C14B A9EA               LDA #$EA
1850 C14D 8D1503             STA $315
1860 C150 AD0EDC             LDA $DC0E
1870 C153 0901               ORA #1
1880 C155 8D0EDC             STA $DC0E
1890 C158 AD1AD0             LDA $D01A
1900 C15B 29FE               AND #$FE
1910 C15D 8D1AD0             STA $D01A
1920 C160 A993               LDA #$93
1930 C162 20D2FF             JSR CHROUT
1940 C165 58                 CLI
1950 C166 D0A7               BNE TEXT
1960 C168 68     OVER        PLA
1970 C169 A8                 TAY
1980 C16A 68                 PLA
1990 C16B AA                 TAX
2000 C16C 68                 PLA
2010 C16D 40                 RTI
```

Once this has been done a SYS49156 call will light up the pixel at the chosen screen coordinate.

The VLIN routine

This is a very simple routine that draws a vertical line on the high resolution screen by implementing the location YCOORD prior to calling the PLOTBIT subroutine. Before calling, set up the following locations with legal values.

Start X coordinate low byte. Location $FB (251).
Start X coordinate high byte. Location $FC (252).
Start Y coordinate. Location $FD (253)
Length of vertical line in range 1 to 200. Location $C201 (49665).

The VLIN routine can be called from BASIC with SYS49160.

The HLIN routine

This is similar to above but draws a horizontal line by incrementing the X coordinate values prior to calling the PLOTBIT subroutine. The routine is slightly more complex because two bytes each are used for the lengthy information and X coordinate values. Remember that the width of the screen is 320 pixels. Before calling from BASIC with SYS49164 set up the following locations with legal values.

Start X coordinate, low byte. Location $FB (251).
Start X coordinate, high byte. Location $FC (252).
Start Y coordinate. Location $FD (253)
Length of horizontal line, low byte. Location $C201 (49665).
Length of horizontal line, high byte. Location $C202 (49666).

The raster Interrupt SERVICE routine.

This is a fairly complex piece of programming to explain so is best treated in detail in the program breakdown section. The SERVICE routine is called each time a raster interrupt occurs this will be at the top of the screen for graphics and, say, two thirds of the way down the screen for text.

Program breakdown

Lines 10 to 150	Assign labelled locations for convenience and ease of programming.
Lines 150	Causes assembly at location $C000 (49152) onwards.
Lines 180 to 250	Form a jump table which calls the chosen routines and returns either to the machine code program that called it or back to BASIC. This practice can save considerable time when modifications are made, since the routines would all have the same apparent calling addresses. Where possible, always use labels and force the assembler to do the tedious work.
Lines 270	Disables interrupts while vectors are changed.
Lines 280 to 290	Clear the screen.
Lines 300 to 310	Set the labelled location BMPAGE to $20 which contains the default base page address of the bit map.
Lines 340	Calls the screen memory fill routine SCRFILL.
Lines 360 to 380	Set bit zero of Control Register A (CRA) of the CIA. This in effect stops the normal keyboard scan interrupts every 1/60th of a second.
Lines 390 to 420	Redirect the interrupt IRQ vector to the SERVICE routine.
Lines 450 to 470	Sets the raster interrupt to occur at the position specified in the location labelled SPLIT by writing to the raster register.
Lines 480 to 500	Drops the most significant bit from the raster count.
Lines 510	Re-enables interrupts to occur.
Lines 540 to 630	Clear the location LOC and produce the mask for setting the (X,Y) coordinate bit.
Lines 640 to 860	Calculate XY coordinate address LOC,LOC+1 (2 bytes). (See earlier text for details).
Lines 930 to 960	Initialise STORE and STORE+1 to the base address of the bit map as set in the location BMPAGE.
Line 970	Sets the X register, the page counter, to $1F. this is set to the nearest whole number of pages (256 byte blocks) to be cleared in the bit map.
Lines 980 to 1040	Form a loop which clear $1F pages of memory, a page at a time, using indirect indexed addressing.
Lines 1050 to 1080	Form a loop which clears the odd $40 bytes of the bit map remaining.
Lines 1150	Loads the accumulator with the combination of colours set up in the location labelled SCRCOL. This can be POKEd in from BASIC as explained earlier.
Lines 1160 to 1280	Load up screen memory locations in a similar loop structure with which the bit map was cleared.
Lines 1310 to 1340	Call the routine PLOTBIT a fixed number of times within a loop to draw a vertical line. Each time round the loop the Y coordinate, YCOORD, is incremented and the length decremented. The loop exits when LENGTH has reached zero. Single byte values are used each time because the maximum number of vertical plot points is 200.
Lines 1370 to 1500	Similarly calls the routine PLOTBIT a fixed number of times. Horizontal lines are drawn by incrementing XCOORD (2 bytes) and decrementing LENGTH (2 bytes). The loop is a double byte loop because the length and X coordinate values can be greater then 255.
Lines 1530 to 1550	Check if bit zero of the interrupt status register is set. If it is found to be clear a branch to the location labelled EXIT occurs.
Lines 1560	Clears bit zero of the interrupt status register flag. This is the raster interrupt flag.
Lines 1570 to 1590	Check if the raster count is in high resolution area of screen when interrupt occurred. If so branch to location HIRES.
Lines 1660 to 1670	Set the next interrupt to occur to an invisible region at the top of the screen and above the displayed area.
Line 1680	Forces a branch to EXIT at all times. Relative branch instructions are always more favoured than absolute JMP instructions because the object code is inherently relocatable.
Lines 1740 to 1760	Set the next interrupt to occur at the position specified in the location labelled SPLIT.
Line 1770	Calls the Kernal routine SCNKEY. This is necessary because the normal keyboard scan has been disabled earlier.
Lines 1780 to 1800	Check if a key has been pressed. If it has been, the program branches to the location OVER.
Line 1810	Disables interrupts while interrupt vectors are changed.
Lines 1820 to 1850	Reset the default interrupt vectors for normal interrupt operation. The normal Commodore interrupt handling routines are at location $EA31.
Lines 1860 to 1880	Clears bit zero of control register A of the CIA, thus restarting the normal 1/60th second keyboard scan interrupts.
Lines 1880 to 1910	Disable further raster interrupts by clearing bit zero of the interrupt enable register.
Lines 1920 to 1930	Clear the screen.
Line 1940	Enables normal interrupts.
Line 1950	Forces a branch always to location TEXT. This ensures that on termination of split screen interrupts, standard text mode is selected.
Lines 1960 to 2010	Pull registers from the stack in the same order that the normal Commodore interrupt service routine would and returns from interrupt.

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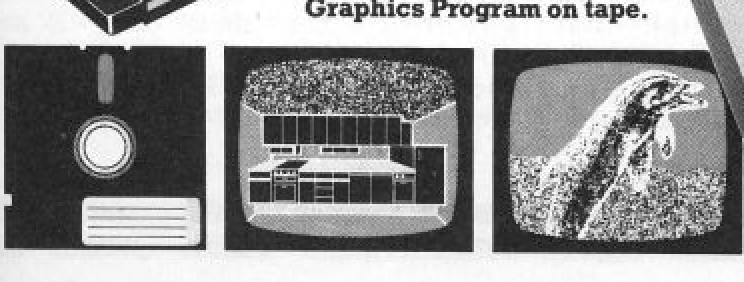


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A.P. and D.J. Stephenson provide a handy plotting routine, together with a program to make graph plotting a little easier.

THE BASIC FACTS

WE THOUGHT THE BEST WAY TO ILLustrate the use of graphics and raster interrupts was to provide a full working program for plotting the graph of any function. We could have concentrated on games graphics but so much has already been written on the subject. Anyway, the Commodore 64 deserves a change sometimes.

It is comparatively easy to use the low resolution 'chunky' graphics available in standard Commodore 64 BASIC. However, unless special ROM modules are installed, high resolution graphics, programmed in BASIC, can be dreadfully slow. Because of this, we advise you to employ machine code routines to supplement the deficiencies of BASIC. However, this series is supposed to be about BASIC so how can we bring in machine code without involving readers who do not feel justified in devoting the necessary study time to this admittedly more difficult subject? A reasonable compromise is to provide a BASIC program which calls on machine code subroutines for handling the tricky bits. The problem of entering the machine code bytes is easily overcome by means of a separate program which loads the machine code hexadecimal bytes, (see Program 11.1).

Program 11.1 must be RUN before the main BASIC program can be used so we must deal with this first.

Details of the hex loader

The object of the program is to read in that rather formidable block of hexadecimal data bytes, representing the machine code, and store them sequentially in memory, starting at the usual safe address $C000 (the second line in the program assigns this address 49152 in decimal to the variable M). Now it is very unlikely, however skilled you are at the keyboard, that all those data bytes are going to be entered first time without error. The bytes are virtually meaningless and, because they do not correspond to any observable pattern, must be entered blindly and without mnemonic aid. Because of the error prone nature we have used a useful trick known as a checksum which will automatically spot the slightest error made during data byte entry at the keyboard. Some readers may be unfamiliar with the checksum technique so a few words of explanation are indicated. After the machine code bytes have been carried out and proven during the development stages, they are added and the resultant figure preserved for subsequent use when the bytes are entered. In this case, the checksum of the bytes, rather surprisingly, happened to be a nice round figure of 46000. This value has been assigned to the variable CH in the second line of the program. When the program is RUN, the hex bytes are added up and the final sum checked with CH (see line 130). Is it fool proof? Well, almost! It is possible, but extremely unlikely, that you make two or more keying errors which together produce a compensation error which just happens to equal the correct checksum. Because such a possibility is remote, you can safely bet that if you get the message 'CODE LOADED OK' all bytes are good. We would warn you however, that you should always SAVE a reserve copy of any program involving machine code, or POKEs before it is actually RUN. It is quite possible that, if you have made an error, the machine will crash causing loss of all bytes and you will have to start again from scratch – a dismal prospect even for the most philosophical of us.

Although we make no attempt here to explain how the machine code sections work, details are to be found in this month's accompanying article MASTERING MACHINE CODE. Both these series are drawing towards their closing months so we thought it would be nice for the two paths to converge.

Finally, it must be emphasised once again that Program 11.1 must be entered and RUN before the BASIC program 11.2

Details of the graph plotting program

Most people shun mathematics, although some grudgingly admitted that mathematics can be useful at times, particularly in this modern age. Fortunately, the computer has made many people aware of the importance of maths and, because it can take on much of the borging drudgery, more and more are showing signs of actually liking the subject. Apart from handling the arithmetic, the computer comes into its own when dealing with graphical output. An equation comes to life when it is presented in form of a graph, showing how one quantity varies in response to changes in another. Program 11.2 does just that.

Program details

As its name implies, the program accepts an equation, together with certain details, entered from the keyboard, and proceeds to plot the curve in high resolution form. The curve appears against a background of calibrated X and Y axes known as cartesian coordinates. For example, we can take a simple equation such as $Y = X^2$. The progressively increasing values of X are plotted on the horizontal axis and the X squared values on the vertical or Y axis. The range of X values will have to be stated by the operator by entering the lowest and highest values. Obviously, real equations will not necessarily be in terms of X and Y but this is of no importance – as far as this program is concerned, its just a question of variable names.

The program distinguishes between two fundamental types of graph, continuous and discontinuous. Most curves are continuous, in the sense that the variables progress smoothly with no sudden breaks or violent lurches towards infinity or –infinity. All we need do is tell the computer the range of X values and it will then calculate all the corresponding Y values which, in most cases, would be well within the capability of the computer's numerical limit. Most equations likely to be encountered are like this but occasionally we come across an awkward specimen. To quote a few examples, Y = sin X, Y = cos X, Y = sin X + cos X - 2X are three examples of well behaved continuous functions. On the other hand, the equations Y = tan X or Y = 1/X are two

Program 11.1

```
10 REM MACHINE CODE HEX LOADER
20 M=49152:CH=46000:S=0:PRINT CHR$(147)
30 PRINT"LOADING MACHINE CODE BYTES:PLEASE WAIT"
40 FOR P=0 TO 365:READ D$
50 FD%=ASC(D$)-48
60 SD%=ASC(RIGHT$(D$,1))-48
70 IF FD%>9 THEN FD%=FD%-7
80 IF SD%>9 THEN SD%=SD%-7
90 BT%=16*FD%+SD%
100 S=S+BT%
110 POKE M+P,BT%
120 NEXT
130 IF S<>CH THEN PRINT"ERROR:CHECKSUM"
140 IF S=CH THEN PRINT"CODE LOADED OK"
150 END
160 REM *
170 REM **
180 REM MACHINE CODE DATA
190 DATA 20,10,C0,60,20,4E,C0,60
200 DATA 20,D1,C0,60,20,DC,C0,60
210 DATA 78,A9,93,20,D2,FF,A9,20
220 DATA 85,FF,A9,04,8D,00,C2,20
230 DATA 90,C0,20,AE,C0,AD,0E,DC
240 DATA 29,FE,8D,0E,DC,A9,FE,8D
250 DATA 14,03,A9,C0,8D,15,03,AD
260 DATA 1A,D0,09,01,8D,1A,D0,A5
270 DATA 02,8D,12,D0,AD,11,D0,29
280 DATA 7F,8D,11,D0,58,60,A5,FB
290 DATA 29,07,AA,38,A9,00,85,5A
300 DATA 6A,CA,10,FC,85,59,A5,FB
310 DATA 29,F8,85,5C,A5,FD,4A,4A
320 DATA 4A,85,5B,4A,66,5A,4A,66
330 DATA 5A,65,5B,85,5B,A5,FD,29
340 DATA 07,65,5A,65,5C,85,5A,A5
350 DATA 5B,65,FC,65,FF,85,5B,A0
360 DATA 00,B1,5A,05,59,91,5A,60
370 DATA A5,FF,85,5D,A9,00,85,5C
380 DATA A2,1F,A0,00,91,5C,88,D0
390 DATA FB,E6,5D,CA,D0,F4,A0,3F
400 DATA 91,5C,88,10,FB,60,A9,00
410 DATA 85,5C,AD,00,C2,85,5D,A5
420 DATA FE,A2,03,A0,00,91,5C,88
430 DATA D0,FB,E6,5D,CA,D0,F4,91
440 DATA 5C,A0,E7,91,5C,88,D0,FB
450 DATA 60,20,4E,C0,E6,FD,CE,01
460 DATA C2,D0,F6,60,20,4E,C0,E6
470 DATA FB,D0,02,E6,FC,38,AD,01
480 DATA C2,E9,01,8D,01,C2,B0,03
490 DATA CE,02,C2,AD,01,C2,D0,E4
500 DATA AD,02,C2,D0,DF,60,AD,19
510 DATA D0,29,01,F0,36,8D,19,D0
520 DATA AD,12,D0,C9,10,90,17,AD
530 DATA 18,D0,29,F7,8D,18,D0,AD
540 DATA 11,D0,29,DF,8D,11,D0,A9
550 DATA 00,8D,12,D0,F0,15,AD,18
560 DATA D0,09,08,8D,18,D0,AD,11
570 DATA D0,09,20,8D,11,D0,A5,02
580 DATA 8D,12,D0,20,9F,FF,20,E4
590 DATA FF,C9,00,F0,23,78,A9,31
600 DATA 8D,14,03,A9,EA,8D,15,03
610 DATA AD,0E,DC,09,01,8D,0E,DC
620 DATA AD,1A,D0,29,FE,8D,1A,D0
630 DATA A9,93,20,D2,FF,58,D0,A7
640 DATA 68,A8,68,AA,68,40
```

examples of discontinuous curves and will tend to infinity at certain points. Now computers, as you probably know, are just as wary of infinity as mathematicians are. There is an upper and lower finite limit to the magnitude of a number that a computer can handle without spitting out an error message of some kind. This means that a function plotter must first ask the operator whether the function is continuous or discontinuous. If the operator tells the computer it is continuous, then the Y axis is scaled automatically and it is only necessary to enter the range of X values over which the equation is to be plotted. On the other hand, if the function is discontinuous, then it will be necessary for the operator to give the Y value range as well as the X value range.

The plotting density, which is another way of stating the resolution, can be defined by the operator on a scale of 1 to 4. Plotting density 1 gives the lowest resolution (small number of plotting points) and plotting density 4 the highest plotting density and therefore the slowest in execution.

There are no error trapping facilities in BASIC so be prepared for the program to break out if incorrect equations are entered. It is also possible for a break out to occur if the calculations attempt division by zero. If this happens, try the program again with different limits of X or perhaps with a different plotting density. This may avoid the region where the division by zero is occuring.

Using the program

To obtain initial familiarity with the program, an example equation is already programmed into line 1000. So, in the first instance, the procedure is:

1. Enter RUN and press RETURN. After some explanatory messages, the program comes to a halt.
2. Enter RUN 1000 and press RETURN. You will then be asked to supply the following information:
   "ENTER X AXIS (MIN)". Try 0.
   "ENTER X AXIS (MAX)". Try 6.28 (which is approximately 2 times pi) since this will produce a graph of sine x over nearly one complete cycle.
   "ENTER PLOTTING DENSITY (1-4)". Suggest you reply with 1, the lowest density but fast to execute.
   "AUTO Y AXIS LIMITING (Y/N)". This is really asking if the curve is continuous and therefore suitable for automatic scaling of the X axis. The built in equation is indeed continuous because it is the sin X function and so you will enter Y.

Assuming everything is OK with your program and the machine code bytes (mentioned earlier) are already resident in RAM, the program should begin to draw the typical sinusoidal graph of the function extending over one cycle,

Program 11.2

```
10 REM HI-RESOLUTION FUNCTION PLOTTER
20 REM (USING MACHINE CODE SUBROUTINES)
30 PRINT CHR$(147):PRINT TAB(14)"GRAPHPLOT":PRINT:PRINT
40 PRINT"PROVISION OF Y AXIS LIMITS ARE NEEDED"
50 PRINT"FOR NON CONTINUOUS GRAPHS ONLY"
60 PRINT:PRINT"ENTER FUNCTION IN LINE 1000 SUCH AS":PRINT
80 PRINT"1000 DEF FN EQ(X)=SIN(X)":PRINT
100 PRINT"ENTER FUNCTION THEN TYPE 'RUN1000'"
110 END
997 REM *
998 REM **
999 REM START OF PROGRAM PROPER
1000 DEF FN EQ(X)=SIN(X)
1005 DIM Y(322):W=319:H=159:PRINT CHR$(147)
1010 DEF FN HI(X)=INT(X/256)
1020 DEF FN LO(X)=X-(FN HI(X)*256)
1022 DEF FN XC(X)=INT(W*(X-XL)/(XR-XL))
1024 DEF FN YC(Y)=INT(H*(YT-Y)/(YT-YB))
1030 INPUT"ENTER X AXIS (MIN)";XL
1040 INPUT"ENTER X AXIS (MAX)";XR
1050 IF XL>=XR OR XL>0 OR XR<0 THEN PRINT"INPUT REJECTED":GOTO 1030
1060 INPUT"ENTER PLOTTING DENSITY (1-4)";A%
1070 IF A%<1 OR A%>4 THEN 1060
1080 A%=A%*80:INC=(XR-XL)/A%
1090 YT=0:YB=0
1100 INPUT"AUTO Y AXIS LIMITING (Y/N)";K$
1120 IF K$="Y" THEN 1180
1130 IF K$="N" THEN 1150
1140 GOTO1100
1150 INPUT"ENTER Y AXIS (MIN) ";YB
1160 INPUT"ENTER Y AXIS (MAX) ";YT
1170 IF YB>=YT OR YB>0 OR YT<0 THEN PRINT"INPUT REJECTED":GOTO 1150
1180 GOSUB8000
1190 POKE254,7:POKE2,216:SYS49152:REM INIT
1200 GOSUB9000
1210 GOSUB10000
1220 FOR N=1 TO 21:PRINT:NEXT
1230 PRINT"LARGE X AXIS DIVISIONS= "XX
1240 PRINT"LARGE Y AXIS DIVISIONS= "YY;
1250 GOSUB7000
1260 END
3997 REM *
3998 REM **
3999 REM CALL VLIN ROUTINE
4000 IF X%<0 OR X%>W OR Y%<0 OR Y%>H THEN 4060
4010 POKE251,FN LO(X%)
4020 POKE252,FN HI(X%)
4030 POKE253,Y%
4040 POKE49665,L%
4050 SYS49160
4060 RETURN
4997 REM *
4998 REM **
4999 REM CALL HLIN ROUTINE
5000 IF X%<0 OR X%>W OR Y%<0 OR Y%>H THEN 5070
```

Program 11.2 (cont)

```
5010 POKE251,FN LO(X%)
5020 POKE252,FN HI(X%)
5030 POKE253,Y%
5040 POKE49665,FN LO(L%)
5050 POKE49666,FN HI(L%)
5060 SYS49164
5070 RETURN
5997 REM *
5998 REM **
5999 REM CALL PLOTBIT ROUTINE
6000 IF X%<0 OR X%>W OR Y%<0 OR Y%>H THEN 6050
6010 POKE251,FN LO(X%)
6020 POKE252,FN HI(X%)
6030 POKE253,Y%
6040 SYS49156
6050 RETURN
6997 REM *
6998 REM **
6999 REM PLOT GRAPH SUBROUTINE
7000 N=0
7010 FOR X=XL TO XR+INC/10 STEP INC
7020 N=N+1
7030 X%=FN XC(X)
7040 Y%=FN YC(Y(N))
7050 GOSUB6000
7060 NEXT
7070 RETURN
7997 REM *
7998 REM **
7999 REM TABULATION SUBROUTINE
8000 PRINT CHR$(147):PRINT"TABULATING"
8010 N=0:FOR X=XL TO XR STEP INC:N=N+1
8020 Y(N)=FN EQ(X)
8030 IF K$="N" THEN 8060
8040 IF YT<Y(N) THEN YT=Y(N)
8050 IF YB>Y(N) THEN YB=Y(N)
8060 NEXT
8070 RETURN
8997 REM *
8998 REM **
8999 REM DRAW AXES SUBROUTINE
9000 X%=FN XC(0)
9010 Y%=0:L%=H+1:GOSUB4000
9020 Y%=FN YC(0)
9030 X%=0:L%=W+1:GOSUB5000
9040 RETURN
9997 REM *
9998 REM **
9999 REM DRAW AXES DIVISIONS SUBROUTINE
10000 K=XR:IF ABS(XL)>=ABS(XR) THEN K=XL
10010 GOSUB11000:XX=R
10020 FOR X=P TO XR+R/10 STEP R
10030 X%=FN XC(X):Y%=FN YC(0)
10040 L%=5:IF Y%>=10 THEN Y%=Y%-5:L%=11
10045 IF Y%>=H-10 THEN L%=L%/2
```

together with calibrated pips on the X and Y axis. You can then try out the program again with perhaps different X limits and perhaps a higher plotting density. For example, try the effect of X (MIN) = -6.28 and X (MAX) = 12.5 and a plotting density of 4. This should show almost three complete cycles of a sine wave.

Using your own equations

Once you have gained familiarity with the program you will naturally want to enter your own equations instead of sticking to the one built in. The instructions to do this are presented on the screen during the initial run but it is worth giving an example. Suppose you want to graph the equation, $Y = 3X + 4X^3$. The line you must enter, when the first part of the program has come to a halt, would be:

1000 DEF FN EQ (X)=3*X+4*X 3

This, of course, will now replace the original line 1000. You must then enter RUN 1000 before the program will continue. The rest is up to you.

If the equation you want happens to be discontinuous, then your reply to the query "AUTO Y AXIS LIMITING (Y/N)" must be N. You will then be asked to enter your own Y limits instead of relying on automatic scaling. If you have no knowledge whatsoever of the behaviour of the function, then this will be very much a trial and error process which must continue until the Y limits are deemed acceptable.

Those who, in the past, have spent hours plotting equations on graph paper with paper and pencil (and rubber) will appreciate the value of this program. An equation like $Y = 3\sin X + 3.67(\cos X - \sin X^2)$ would be drawn in seconds by the computer. How long would it take you without one?

How the program works

Drawing some sort of graph on the screen is relatively easy. The trouble arises when you have to tailor the graph to make full use of the available screen area and, more importantly, to avoid overstepping the boundaries. This means that all actual X values and corresponding Y values can not be used in their raw form. This means that,

a) The maximum and minimum Y values must first be found.
b) The calculations must then be scaled to fit into the screen area but without wasting any space.
c) The scaled values must then be transformed into the appropriate screen coordinates.

As you will appreciate, the entire project is far from easy and so you will understand why the program may seem rather lengthy. Another complication is the production of calibration pips on the

Program 11.2 (cont)

```
10050 GOSUB4000:NEXT
10060 FOR X=P TO XR+R/10 STEP R/4
10070 X%=FN XC(X):Y%=FN YC(0)
10080 L%=3:IF Y%>=10 THEN Y%=Y%-2:L%=5
10085 IF Y%>=H-10 THEN L%=L%/2
10090 GOSUB4000:NEXT
10110 K=YT:IF ABS(YB)>=ABS(YT) THEN K=YB
10120 GOSUB11000:YY=R
10130 FOR Y=P TO YT+R/10 STEP R
10140 X%=FN XC(0):Y%=FN YC(Y)
10150 L%=5:IF X%>=10 THEN X%=X%-5:L%=11
10155 IF X%>=W-10 THEN L%=L%/2
10160 GOSUB5000:NEXT
10170 FOR Y=P TO YT+R/10 STEP R/4
10180 X%=FN XC(0):Y%=FN YC(Y)
10190 L%=3:IF X%>=10 THEN X%=X%-2:L%=5
10195 IF X%>=W-10 THEN L%=L%/2
10200 GOSUB5000:NEXT
10210 RETURN
10997 REM *
10998 REM **
10999 REM FIND GRADUATION INCREMENT
11000 E=0
11010 K=ABS(K)
11020 IF K<1 THEN K=K*10:E=E-1
11030 IF K>=10 THEN K=K/10:E=E+1
11040 IF K<1 OR K>=10 THEN 11020
11050 K=-INT(K+1)
11060 P=K*10^E
11070 R=1*10^E
11080 RETURN
```

screen. The program has been arranged so that the pips represent integral powers of ten. This should make it easy to read off the values. A text window, of about four lines, at the foot of the screen is employed to display the values of these axes graduation increments. Raster interrupt techniques are used to display and switch between the high resolution screen and the text screen.

The program has been written, as far as possible, in tight, self contained, subroutines. The meat of the program begins at line 1000 with a batch of five user-defined functions followed by the set of keyboard prompt messages. This is all fairly straight forward asking for X and Y value limits, plotting densities etc.

Calling the Machine Code INIT routines

Line 1190 calls an initialising machine code routine called INIT. This machine code subroutine sets up the faster interrupts, clears screen memory and the 8K bit map area. Two parameters need to be passed before calling the INIT routine.

1. The two colours allowable in the standard high resolution mode need to be POKEed into location $FE (254 decimal). The upper nibble (4 bits or half a byte) is set to zero (black) and the lower nibble is set to 7 (yellow). Therefore POKEing 7 into location 254 specifies a black graph on a yellow background.

2. The position of the screen split between graphics and text needs to be POKEd into location $02 (2). POKEing 216 into location 2 produces a text window of about four lines at the bottom of the screen.

The subroutines

CALL VLIN ROUTINE (GOSUB 4000)

Draws a vertical line of length, L%, starting at the screen coordinates specified by X% and Y%. The purpose of using the DEFined function FN LO(X%) and FN HI (X%) is to split the X screen coordinate X%, which may exceed 255, into two-byte form for direct POKEing into locations $FB (251) and $FC (252). The length parameter, L%, must be POKEed into location $C200 (49665).

L% should be within the range 1 to 200.
Y% should be within the range 0 to 199.
X% should be within the range 0 to 359.
Once the parameters have been POKEd the machine code subroutine is called from BASIC with SYS 49160.

CALL HLIN ROUTINE (GOSUB 5000)

This sets up the parameters and calls a machine code routine for drawing a horizontal line. Parameters are identical to above except of course that L% can be as large as 360. Therefore the functions FN LO(L%) and FN HI(L%) are needed to POKE the necessary bytes into $C200 (49665) and $C201 (49666).

CALL PLOTBIT ROUTINE (GOSUB 6000)

Lights up a pixel at the prescribed screen coordinates by calling on a machine code subroutine from BASIC with SYS 49156. The parameters that need to be POKEd prior to calling are the X coordinate X% and the Y coordinate Y%. The X coordinate value must be split into low byte and high byte form as above. The Y coordinate value Y% is always less than 255 so can be POKEd directly. The machine code subroutine itself is called from BASIC with SYS 49156.

PLOT GRAPH (GOSUB 7000)

Plots the actual graph with the aid of FN XC and FN YC. These scaling functions translate the actual values of X and Y to a scaled value within the available screen area. The subroutine frequently employs the CALL PLOTBIT SUBROUTINE to light up individual pixels corresponding to the graph.

TABULATION (GOSUB 8000)

This subroutine is responsible for finding the maximum and minimum values of the function and also calculating all Y values corresponding to the X values. The individual results are then held in the array Y (N), ready for use in plotting the graph. If the function, was deemed by the operator to be discontinuous, (answered N to the query instead of Y) then lines 8040 and 8050 are not skipped.

DRAWS AXIS (GOSUB 9000)

Draws the X and Y axis of the graph.

DRAW AXIS DIVISIONS (GOSUB 10000)

Draws and positions the calibration pips which are to appear on the axis. Each large graduation interval, corresponding to an integer power of ten, is further divided into 3 small graduations to assist accurate readings of the graph.

FIND GRADUATION INCREMENT (GOSUB 11000)

This subroutine calculates the range and integer powers of ten increment for the graduation pip positioning and is used in conjunction with the previous subroutine.

The full assembler listing and detailed descriptions of the various machine code routines are in the MASTERING MACHINE CODE article in this issue of YOUR COMMODORE.



Runecaster discovers that adventures don't really need text with two games that set new standards for adventure programs.

SOME MONTHS BACK WE LOOKED AT that incredible arcade adventure 'Impossible Mission'. Fantastic graphics and as has been proved by its sales, a winner all the way. In between guiding the hero around the screen in all sorts of athletic manoeuvres, various operations are performed by moving a cursor over a selection of small pictures, or icons, to issue input commands to the computer.

This use of icons is very much in vogue at the moment, with many business systems using this technique in striving to make programs ultra simple and foolproof to use. More often than not speed of use is sacrificed slightly, as it is often quicker to type LOAD PROGRAM than to manipulate a cursor over the appropriate icon and initiate the command!

Nevertheless 'icon driven' programs have much to offer, by making input commands limited to only those that may be understood and acted upon. They often employ good graphic effects, especially when full colour, hi-res pictures are used, such as in Beyond Software's 'Shadowfire'

Shadowfire

The instruction booklet insists that there are NO riddlesome texts to impede the fast flow of real time, high speed adventure. The screen presentation is in a word – excellent – and although the speed of operation is in practice, perhaps not so fast as one has been lead to expect; it is difficult to see how the independent handling of six different characters could be improved upon by any other system.

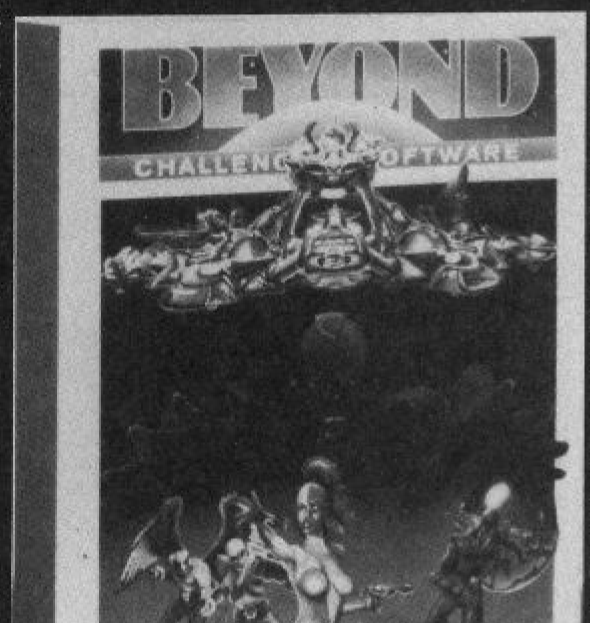
The basic scenario revolves around the kidnapping of one Ambassador Kryxix, who has a top secret micro-disc imbedded in his spine (!). He must be rescued quickly and at any cost.

Super baddie General Zoff, holds Kryxix captive aboard his personal 'sky-fortress' behind an asteroid belt. Who can possibly penetrate such a heavily defended position and successfully complete this mission in such a short time.

Enter...Enigma, a secretive organisation with its operatives a classic mixture of whiter than white, noble and dedicated 'super persons' together with barely controlled 'super criminals' and the latest in cybernetic androids.

You have control (well almost), over this team of stalking death dealers. You have one hour and forty minutes in which to locate and free the prisoner, capture General Zoff and destroy his skyfortress. Use the time wisely, you will need every second.

Control may be either from the keyboard, analogue or digital joysticks (the normal joystick is digital) or even by the use of a light-pen. Reading the operating manual is a must! You may not assimilate all that it has to tell you at the first read but to start your mission some or all of your team have got to be transported over to General Zoff's skyfortress. Without reading the manual this may take you some time to organise!



Likewise each team member has specialised training in various areas. So before you start arming them for the ensuing mission...read the manual. Only one can carry and operate the portable transporter beacons. Only one can successfully pick the locks to be found on the enemy craft.

You may only issue orders to one person at a time (is an android a person?) On selecting the member to instruct, the display graphically shows you that person's status – strength, agility, stamina and the weight they are carrying.

The display also depicts graphically the present status of all the team members – whether they are inactive, attacking, moving defending, weak, dying etc. A 'view screen' gives you a plan of the immediate area around the chosen character, including other team members and enemy patrols (if either is present).

Finally a box at the bottom right of the screen encloses the icons for further commands. You may choose the Object, Movement or Battle screens, or you may Quit issuing commands on that screen.

Choose the Object screen and you will again be presented with a series of icons. Those in the box to the right allow you to manipulate the objects shown in the other two boxes. Those to the left are what is visible at that location and those in the centre are what that character is already carrying. The control icons permit picking up, dropping, activation or readying for use. Three others enable you to display the other control screens or Quit.

The Movement screen displays eight arrows indicating the possible directions of movement, although not all eight directions may be permitted.

The Battle screen allows the choice of attack, defend, retreat or just observe; in any of eight directions. Having made your choice, any characters visible in that direction are displayed in a box on the left.

As you may have gathered, starting out

takes a little concentration! Fortunately the learning period is short, partially due to the clear instructions and partially due to the simplistic icon control system.

Moving around...

Again...read the manual! Android Manto; is the only team member who can operate the transporter beacons and the wrong sequence of moves can leave Manto on the enemy craft without any means of returning, or of summoning any help!

When transporting any team members, make sure that they are adequately armed...you may well meet some enemy troopers sooner than you expect. Also take note of the brief notes on your team's character profiles...there is more in them than first meets the eye.

Like any adventure game you cannot expect to solve this one at one sitting. You will need to map out the enemy ship if only to find out what are mere cupboards and what are important passageways. Remember that some characters move faster than others and could well prove to be admirable scouts.

Unlike most adventures there do not appear to be many objects to find and puzzle over...on the other hand not all objects found are described in the manual. Some are weapons, even if you don't know exactly what they do!

The frequency of meeting enemy troops also appears to be somewhat random, and one early game had me manoeuvring five characters around for over an hour with only two 'incidents' and nothing of great interest to report!

Although the 'icon drive' system works very well and new screen displays are 'drawn' very quickly for a hi-res screen, there is an appreciable delay whilst you are itching to DO something. There are plenty of locations to explore but really very little variety in the objects to be found.

There is a SAVE game facility, so before entering into what may be a fatal confrontation with the enemy – you can always 'hedge your bets'. Never forget that 'he who runs away, lives to fight another day'!

The puzzles are more of 'mapping' and 'battle strategy'...if you like the 'hunter killer' scenario then 'Shadowfire' is a must. Even if this is not your first choice in adventure games, it will surely be a classic of its type and I suspect will tempt you back many times as you attempt to better your previous efforts...

It is also interesting to note that Beyond propose to offer a 'Shadowfire Tuner' in the Autumn. This will allow you to alter the Enigma team's strengths and weaknesses, re-locate weapoons and objects, map out the skyfortress and more! Could this be because they think the game is too easy...or too hard. Whichever is the answer, it can only add to the possibilities of a good game.



tír na nòg

BY GARGOYLE GAMES

tír na nòg



GARGOYLE GAMES

Commodore 64

Tir na Nog

Here we have another graphic arcade adventure, it has to have the word 'arcade' because a certain amount of dexterity is called for in controlling our hero Cuchulainn. It is more truly a pure graphics adventure.

Tir na Nog is the Land of Youth in Irish myth, the same world in which the inhabitants of the fairy mounds lived. Cuchulainn was a great hero of Ulster again in Irish legend, and the stories of his prowess and daring are legion.

Gargoyle Games have combined a number of factual (well I believe in race memory anyway...) and fanciful situations and places to produce quite a remarkable adventure. The aim being to guide Cuchulainn in finding the four scattered parts of the Seal of Calum. The only answer to controlling or inhibiting the Great Enemy. The seal was shattered eons ago, freeing the Enemy to pursue his evil ways.

The shade of the dead hero Cuchulainn strolls, strides and ambles across your screen in search of the four parts of the seal. The graphic representation of this hero is quite heroic! The figure is large enough on your display to quite stir one's admiration for the programmer.

The background scrolls smoothly past giving the nearest yet to the idea of computer movies. Control is from the keyboard, and is not the easiest thing to come to grips with! You can in fact only direct him to move to the left or the right...but, to confuse the issue, you can view him from any of four directions! This means he can walk to the East by either moving to the left or the right – depending upon whether you are looking at him from the South or the North! Initially this takes quite a bit of getting used to...

To make matters worse there are any number of Sidhe wandering around. Should you meet one of these creatures and not possess a weapon that can affect them, you are sent back (you cannot be killed...you are already dead!) to your starting place by the Altar of the Seal. If you are unable to control our hero with any certainty, then the more likely you are to loose any objects found to date and end up starting again!

The moral here is to spend time right at the beginning learning how to control his movements. Once you have some semblance of control, then you must begin to map Tir na Nog.

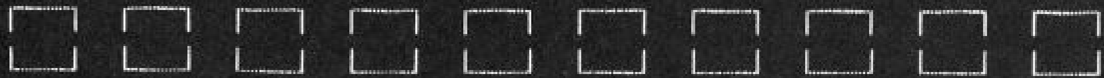
The Sidhe are presumably degenerate descendants of the Side of the myths – the original inhabitants of the fairy mounds that abound in Tir na Nog. Enter these and although time does not slow down as in the myths, you may well be in for a surprise when you take a different exit...Magical transportation is fairly common!

Artefacts lie around for the taking and all appear to have some use...you just have to find what that use is! Also bear in mind that there are a number of invisible 'doorways', so if you seem to be in an impossible situation, keep moving in different directions...there is probably an exit you cannot see!

Each object that you pick up may be used as a weapon and you have the choice of those carried as to which to use. Again this means quite a long 'learning cycle' while you learn what is effective where. On the other hand there is a SAVE game facility...make use of it...

Definitely a game to investigate, with plenty of interest that maintains a Celtic mythos most convincingly. Frustrating on many occasions but once you have got the hang of what is expected of you...quite addictive.

```
5 REM***ADVENTURE MAP GENERATOR***
6 REM***BY M.D.CLARKSON***
10 POKE 53280,0 : POKE 53281,0 : PRINT "▒▒"
30 GOSUB 250
40 PRINT "SET UP PRINTER FIRST ▒THEN ▒PRESS ANY KEY▒ TO PRINT A COPY"
50 POKE 198,0 : WAIT 198,1
60 GOSUB 250: PRINT "PLEASE WAIT....."
70 OPEN 4,4
80 PRINT#4, "ADVENTURE TITLE_________________________________
90 PRINT#4
100 FOR NL = 1 TO 20
110 FOR TR = 1 TO 16
120 PRINT#4, "┌──┐  ";
130 NEXT TR
140 FOR BR = 1 TO 16
150 PRINT#4, "└──┘  ";
160 NEXT BR
170 PRINT#4, : PRINT#4,
180 NEXT NL
190 CLOSE 4
200 GOSUB 250: PRINT "ANOTHER COPY ? "
210 PRINT "▒PRESS Y OR N"
220 GET A$ : IF A$ = "Y" THEN 30
230 IF A$ = "N" THEN PRINT "▒" : END
240 GOTO 220
250 PRINT "▒ADVENTURE MAP GENERATOR▒▒" : RETURN
```



Adventure MAP Generator
Variables used:-

TL	loop for number of squares down
TR	loop for top half of square
BR	loop for bottom half of square

Line explanation:-

10	sets Border, Background and Text colours
40	Prints warning on screen
50	waits for key press before printing
60	clears screen and asks user to wait
70	opens channel to printer
80	prints heading at top of page with space for name of adventure and date
90	prints blank line
100-130	starts loop for number of squares down loop for top half of square
120	prints top half of square (graphics are – shift 0 – Commodore shift Y – shift P – 2 spaces)
140-160	loop for bottom half of square
150	prints bottom half of square (graphics are – shift L – Commodore shift P – shift – 2 spaces)
170	prints 2 blank lines
180	ends loop for number of squares down
190	closes channel to printer
200-240	asks another copy ?, or ends
250	prints program tilt

Mapping an adventure

We have not published any program listings before in Sense of Adventure but there is always room for something interesting or useful. Here is one such, an Adventure Map Generator by Malcolm Clarkson of Scunthorpe.

I have mentioned many times, the necessity to map your travels within adventure games and have on several occasions drawn your attention to the excellent Adventure Planner pads produced by Print 'n' Plotter. Malcolm's program will enable those of you with a printer to create your own...

The program will work on a CBM 64 with an MPS 801 or equivalent printer. As written it will print 320 squares on a sheet, in a 16 x 20 grid. The listing, variable list and line notes should be self explanatory. The squares are small and are intended for just a number, you will have to keep a separate record of what each number signifies.

The reduction of the number of boxes (down the page) in line 100 together with the addition of a PRINT (or even another FOR...NEXT loop printing two vertical lines) at line 135, would lengthen the boxes and enable more to be written with them. Anyway the program works as is...experiment with it to suit your needs.

RELIABLE ROUTINES

Mike Hart rectifies some of the faults of Commodore Basic with handy REPEAT and DO loops.

IT IS WELL-KNOWN BY NOW THAT THE version of BASIC contained in the C64 and the VIC is tired to put it politely, deriving from the version of BASIC found in the PETS. The most obvious ommisions are the absence of control loops such as DO...WHILE or REPEAT...UNTIL which are found in more recent (and better structured) BASICS such as version 7.0 in the C128.

However it is possible to simulate both of these structures by using CBM BASIC in particular ways. I shall present here two ways of adding REPEAT...UNTIL loops, the first being in BASIC itself whilst the second is a machine-code routine.

REPEAT...UNTIL in BASIC

To implement REPEAT...UNTIL in BASIC we can utilise FOR...NEXT loops as our basic building block. In the traditional FOR...NEXT loop we are using the loop counter to specify the number of times that we wish to have an operation performed. The trick is to make the FOR...NEXT loop an endless loop (i.e. repeat itself) whilst a condition is untrue i.e. logically false but have the loop end when the condition under test is true. So there are two processes involved here – let us consider both in turn.

Firstly, how do we make the loop endlessly repeat itself? The answer lies in knowing how the loop operates in the first place. The loop will always be performed at least once. When NEXT is encountered the step increment will be added to the loop variable. The new loop value is now checked against the specified upper limit and if it is less (or with a negative step greater) then the loop is reactivated. If we specify a STEP size of 0 then usually the upper limit will never be exceeded and the loop will repeat indefinitely. To check this out the reader can see that the following loop will never end until the RUN-STOP key is pressed:

FOR J = TO 2 STEP 0 : NEXT J

The next stage in the process is to use logical operators to determine the truth of an expression. If an expression is 'false' then a value of 0 will be produced. So in the expression:

A = 10 : B = (A = 9): PRINT B

B will always take a value of 0. If we were to change the expression so that B = (A = 10) we now find that B is true and has a value of -1. To make our REPEAT...UNTIL loop all we have to do is make an endless loop which repeats indefinitely when the conditionn is false i.e. 0 but which ends when the condition is true i.e. -1.

We achieve this in the following way. I am assuming that we wish to double and print out a number until such time as the number exceeds 1000.

```
10 A = 1
20 FOR J = 0 TO -1 STEP 0
30 A = 2 * A : PRINT A
40 J = (A>1000) : NEXT J
```

Whilst A is less than 1000 then J will be false i.e. 0. When incremented by a STEP of 0 it remains 0. This is greater than -1 and so the loop continues. When A = 1024, it is 'true' that A > 1000 and so J is made to -1. This is incremented still by 0 but -1 is not greater than the end-limit and so the loop ends.

Program Listing

```
B*
    PC   SR AC XR YR SP
.;0008 30 4F 4F 00 F6
.
02A7 4C 3C 03      JMP $033C
02AA A2 02         LDX #$02
02AC BD A7 02      LDA $02A7,X
02AF 95 73         STA $73,X
02B1 CA            DEX
02B2 10 F8         BPL $02AC
02B4 86 02         STX $02
02B6 60            RTS
02B7 A2 02         LDX #$02
02B9 BD A2 E3      LDA $E3A2,X
02BC 95 73         STA $73,X
02BE CA            DEX
02BF 10 F8         BPL $02B9
02C1 60            RTS
02C2 E6 7A         INC $7A
02C4 D0 02         BNE $02C8
02C6 E6 7B         INC $7B
02C8 A0 00         LDY #$00
02CA B1 7A         LDA ($7A),Y
02CC 60            RTS
```

Program Listing

```
B*
   PC  SR AC XR YR SP
.;0008 30 4F 4F 00 F6
.
033C 20 C2 02     JSR $02C2
033F C9 26        CMP #$26
0341 F0 03        BEQ $0346
0343 4C 79 00     JMP $0079
0346 20 C2 02     JSR $02C2
0349 C9 55        CMP #$55
034B F0 25        BEQ $0372
034D C9 52        CMP #$52
034F D0 F2        BNE $0343
0351 E6 02        INC $02
0353 A5 02        LDA $02
0355 0A           ASL
0356 0A           ASL
0357 AA           TAX
0358 A5 7B        LDA $7B
035A 9D CD 02     STA $02CD,X
035D A5 7A        LDA $7A
035F 9D CE 02     STA $02CE,X
0362 A5 3A        LDA $3A
0364 9D CF 02     STA $02CF,X
0367 A5 39        LDA $39
0369 9D D0 02     STA $02D0,X
036C 20 C2 02     JSR $02C2
036F 4C AE A7     JMP $A7AE
0372 20 C2 02     JSR $02C2
0375 20 C2 02     JSR $02C2
0378 20 9E AD     JSR $AD9E
037B A5 61        LDA $61
037D F0 05        BEQ $0384
037F C6 02        DEC $02
0381 4C 40 A9     JMP $A940
0384 A5 02        LDA $02
0386 0A           ASL
0387 0A           ASL
0388 AA           TAX
0389 BD CD 02     LDA $02CD,X
038C 85 7B        STA $7B
038E BD CE 02     LDA $02CE,X
0391 85 7A        STA $7A
0393 BD CF 02     LDA $02CF,X
0396 85 3A        STA $3A
0398 BD D0 02     LDA $02D0,X
039B 85 39        STA $39
039D 68           PLA
039E 68           PLA
039F 4C E4 A7     JMP $A7E4
```

This an example of a REPEAT...UNTIL loop but a DO...WHILE loop will test the condition before processing and skip the further processing if this proves not to be necessary. To turn the above into a DO...WHILE loop then make line 10 A = 1001 and add a new line:
25 IF A>1000 THEN J = -1 : GOTO 40
As you can see, the processing section of the loop is completely missed out if initially A is set to a value greater than the upper limit.

REPEAT...UNTIL in machine code

Also given is an implementation of REPEAT...UNTIL in machine-code in a form which works on both the VIC and the C-64. By altering CHRGET to look for the & character, the routine identifies when a R (for REPEAT) or a U (for UNTIL) are required. Just a few points need to be made about this implementation. Firstly, it is now the programmer's responsibility to make sure that the looping variable is correctly initialised – see line 160. Secondly, notice that nested REPEAT-UNTIL are possible – in fact a secondary stack is created to allow for nesting up to 12 deep.

Re location

To minimise relocation difficulties, the routine is split into two halves, the first half of which occupies $02A7-$02CC where it should be safe! The second half of the routine can go anywhere that is protected although I have put it in the cassette buffer. The second half of the routine makes calls into the first half of the routine both to initialise and reset the CHRGET routine (which looks for and processes BASIC characters one at a time) and also builds up a stack of line addresses and pointers. This is to ensure that when a &U is met the interpreter 'knows' where to return to and keeps the line numbers correct. Locations 680 and 681 should contain the low and high bytes of the start location of the main routine. If C64 owners wished to put the main routine into $C000 then they could make S in line 14 equal to 49152 and lines 20-21 would ensure that the correct low and high bytes were poked into position.

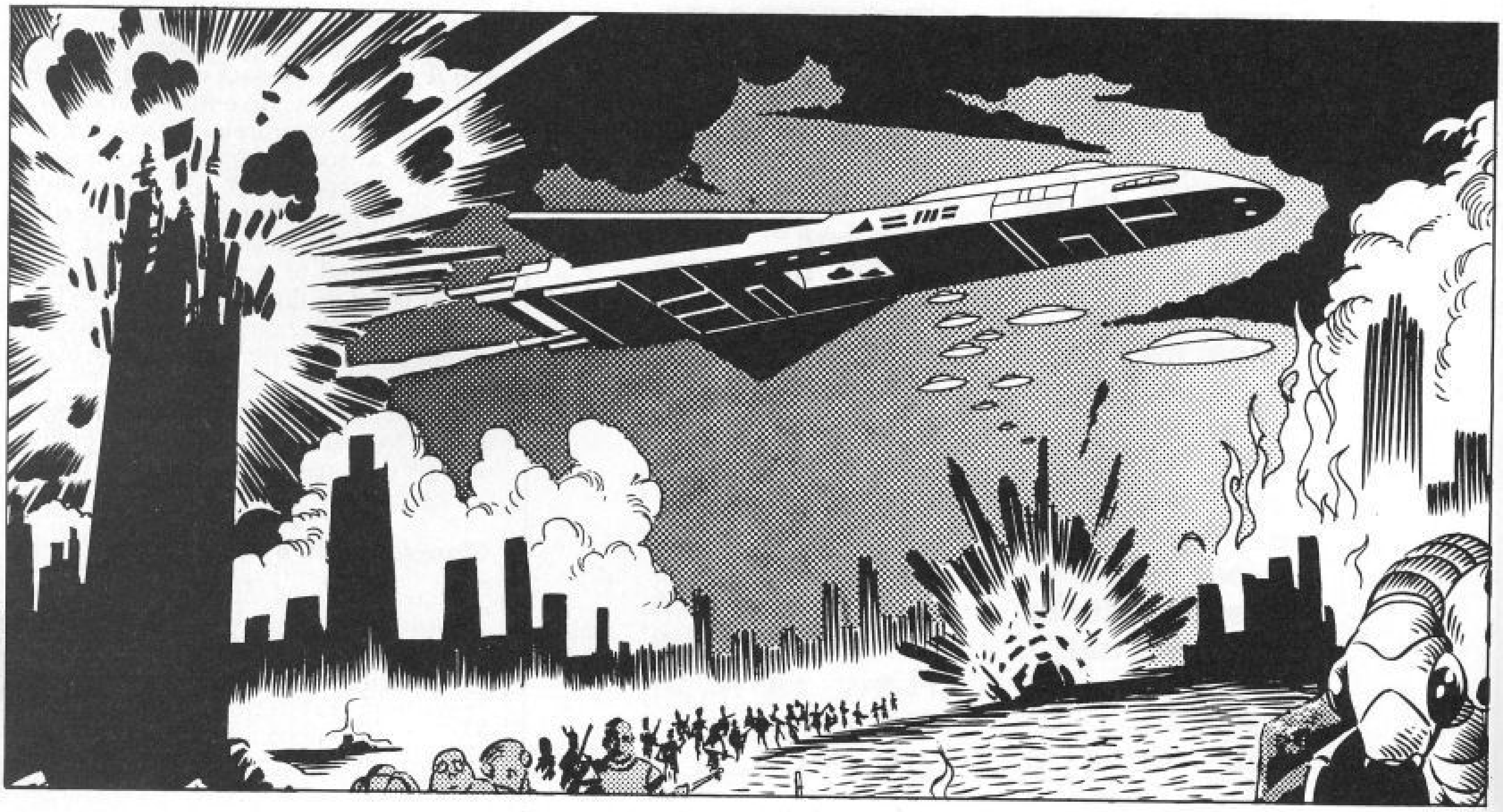
Finally, for VIC owners a list of changes is given to enable them to run the routine on their own machines. It has been tested out on both!

Changes for VIC owners

Line	*Byte*	*From*	*To*
52	4	162	135
54	7	4661	4634
61	6	167	199
62	7	173	205
53	8	169	201
67	6	167	199
67	7	11500	11628

Program Listing (cont.)

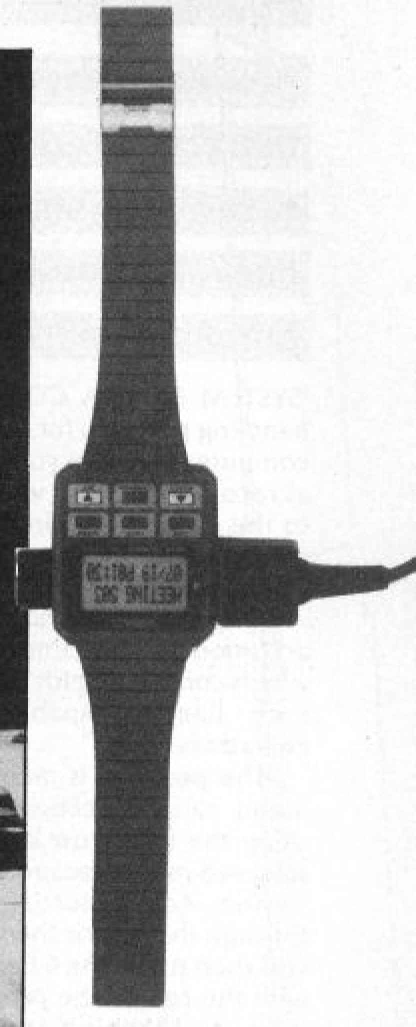
```
1 REM **** REPEAT-UNTIL ****
2 REM          C-64
3 :
4 REM  ***  M. C. HART  ***
5 :
6 REM SYNTAX:&R:<EXP>....&U:<EXP>
7 REM INITIALISE WITH ..SYS 682
8 REM RESTORE WITH .....SYS 695
9 :
10 T=0:FOR J=679 TO 716:READ X:T=T+X
11 POKE J,X:NEXT:READ CH
12 IF CH<>T THEN PRINT "DATA ERROR!":END
13 :
14 S=828: REM LOC'N OF MAIN CODE
15 :
16 T=0:FOR J=S TO S+101:READ X:T=T+X
17 POKE J,X:NEXT:READ CH
18 IF CH<>T THEN PRINT "DATA ERROR!":END
19 :
20 POKE 681,S/256:REM LOC'N HIGH
21 POKE680,S-PEEK(681)*256:REM LOC'N LOW
22 PRINT:PRINT"CODE ENTERED O.K."
23 PRINT:PRINT"RUN 100 FOR DEMO":END
24 :
50 DATA 76,60,3,162,2,189,167,2
51 DATA 149,115,202,16,248,134,2,96
52 DATA 162,2,189,162,227,149,115,202
53 DATA 16,248,96,230,122,208,2,230
54 DATA 123,160,0,177,122,96,4681
55 DATA 32,194,2,201,38,240,3,76
56 DATA 121,0,32,194,2,201,85,240
57 DATA 37,201,82,208,242,230,2,165
58 DATA 2,10,10,170,165,123,157,205
59 DATA 2,165,122,157,206,2,165,58
60 DATA 157,207,2,165,57,157,208,2
61 DATA 32,194,2,76,174,167,32,194
62 DATA 2,32,194,2,32,158,173,165
63 DATA 97,240,5,198,2,76,64,169
64 DATA 165,2,10,10,170,189,205,2
65 DATA 133,123,189,206,2,133,122,
66 DATA 207,2,133,58,189,208,2,133
67 DATA 57,104,104,76,228,167,11500
69 :
100 REM *** DEMO REPEAT-UNTIL ***
110 :
120 SYS 682 :REM INITIALISE
130 :
140 &R:A=A+1:PRINT"OUTER";A:REM OU
150 :
160 J=0 :REM NB ZERO BEFORE INNER LOO.
170 :
180 :   &R:J=J+1:PRINT J,:REM INNER
190 :   &U:J=4:PRINT:REM INNER
200 :
210 &U:A=10:REM OUTER
220 :
230 SYS 695:REM RESTORE CHRGET
240 PRINT"--END--":END
```



Norman Doyle clocks on to Seiko's RC-1000 wrist terminal.

WATCH OUT!







THE SEIKO RC-1000, RETAILING AT around £119, comes complete with application software on disk or cassette and a clip on connector which fits neatly onto two of the pins on the edge of the user port. It measures 41.8 × 10.6 mm, weighs 60 grams and has room for twelve characters on each of the two rows on its LCD display. Internal memory consists of SK ROM and 2K RAM.

This new device converts the usual wrist-borne technology into a state-of-the-art device which transcends the mere timepiece of the past and hints at what the future has in store for the busy jet-setting executive. It is not merely able to display the time and date but also has a daily alarm function and can remind you of birthdays, anniversaries and special appointments. It can display the current time in named cities, towns or villages worldwide, corrected according to time-zone, act as a memory aid, a daily routine reminder, and store telephone numbers. The applications are limited only by its 2K RAM memory.

What's all this got to do with Your Commodore? Well, all this information has to be fed into the watch and what better way than via the pseudo RS 232 user port on the back of the Commodore 64?

The 64 software supplied with the database watch is written in BASIC allowing the knowledgeable user to modify the routines. But if anyone can come up with a more user-friendly version I'm sure it would make the watch a more attractive proposition – more of that later.

Using the program, data can be entered under one of four categories: weekly alarm, schedule alarm, world time and memo. Time details for the alarm occupy the lower twelve character line of the 24-character display leaving the upper line for text to remind you of the purpose for the alarm, such as SEE DENTIST or NORMANS BRTHDY. They can be set to remind you of appointments either on a daily routine basis or for any specific time on a future date.

World times may be selected from any of the 158 cities stored by the program, but new data can be added if the place you require does not appear on the list, either by permanently changing the DATA statements in the program or by a temporary software-controlled addition.

The most flexible function of the unit is the memo facility. These entries may be further sub-divided into categories which suit your personal needs. Each entry can cover the two lines of the display or even overflow onto more lines if necessary. This means that telephone numbers can be stored with a name label to remind you whose number it is, or even crib notes for an exam, though only very brief notes could be made to avoid arousing the invigilator's suspicions by constant key pressing!

The length of each main data category is selected by the user, so the database could consist solely of memos or schedule alarms. The only limit on its use is that a maximum of 80 entries of 24 characters each can be entered into the memory.

I was bitterly disappointed with the quality of the software. Consider for a moment the main market for this kind of equipment, the busy executive. The chancesare that the programming of the watch would be delegated to a personal assistant or secretary, whose life is probably complicated enough without having to grapple with the complexities of the software provided. User-friendly implies that the user can simply load and run the program. I tried this with the Seiko package and failed miserably, despite the two help screens and menus.

I also had to study the manual carefully to understand the program fully. Data entry was laborious and I was disappointed by the length of time it took to save the data to disc; I shudder to think how long it would take to save to tape.

Another drawback of the system is the fact that reprogramming requires hooking up to a computer so the executive will still have to carry a notebook to write down appointments which can later be entered into the the watch's memory. A case of hi-tech for hi-tech's sake.

Casio have also produced a similar watch into which data can be stored simply by writing with your finger on the sensitised display cover. Now, if someone could find a way to store that data into a computer database that would be a force to be reckoned with.

SYSTEM 64

How often have you wished that your 64 could help you to sort out your address book. Well now it can with this program from J.A. Wolfe.

'SYSTEM 64' IS A COMPLETE ADDRESS handling program for the Commodore 64 computer. It allows you to store addresses as records in a file as well as listing the file to the screen, deleting records, printing records and recalling them from tape when required.

The program has been written to accomodate 250 names in each file, each which contain 6 fields or address lines and each line is capable of holding 30 characters.

The program is menu driven and the menu can be accessed at any time by using the left arrow key which has been assigned as the escape key.

The *Add records* section searches through the file for the first empty record and then offers the 6 fields to be filled. As with the rest of the program this section uses a Machine code routine to compensate for the rather clumsy INPUT command offered by BASIC V2. The keys valid during the routine are held in the variable KEY$ and all other keys including RUN STOP are ignored. Any fields not required may be left empty simply by pressing RETURN.

The *Delete records* section requests the number of the record that is to be removed from the file and on a valid response will display the first line (theoretically the addressee) of that record before asking for confirmation of deletion. On escaping from this routine the file is collapsed to fill any holes created when deleting records. The reason for this is to compact the file so that time is saved during saving and loading operations; as only full records are stored to tape. This 'Shuffle routine' is the only other part of the program which could be better if written in Machine code as, depending on the amount of records deleted, it can take 45 seconds or more to execute, although it does save minutes in the parts of the program forementioned.

The *List file* section will display the first line of each record (20 records at a time) on the screen, any empty records are shown as asterix.

The *Print records* part of the program requests the numbers of the first and last records to be printed and allows you to reference the screen listing of the file; if the last parameter overlaps into empty records these will be ignored. The screen will then display a diagram to illustrate how the printer should be set up. Should you have trouble with paper feed or cartridge adjustment during printing, a pause feature is included which then gives the option of continuing or abandoning the print.

Tractored labels are cheap if you buy in fairly large amounts, although you can always use ordinary printed paper and cut it into labels as required.

As a final note on the print routine, it has been written for the Commodore MPS 801 although it should run on other printers with little or no alteration.

The *Save file* and *Load file* sections are fairly straightforward, I would recommend that files are saved on to a separate tape from that containing the program and that back-up copies are saved regularly. As an assurance, I have included a status check after saving any file and if this produces an error, the program will return to the *Save file* screen.

Text is positioned on the screen by using the TAB statement and a string variable CD$ which holds 24 cursor down characters compensating for the missing PRINT AT command and avoiding the use of cumbersome cursor control characters in PRINT statements. The same applies to the text colour which wherever possible is assigned to the variable TX although in some places using the colour control characters has proved easier than continually opening and closing PRINT statements.

The variable FS in line 70 which holds the file size may be increased without altering any other part of the program, however the following should be considered when using the DIM

5 Bytes are used for the array name.
2 Bytes are used for each dimension.
3 Bytes are used for string variables.
1 Byte is used for each character in each string element.

Variables used by 'SYSTEM 64'

KEY$	— Characters valid during input.	UL$	— Used for underlining.
BO	— Border colour.	L$	— (1-6) Fields containing address lines.
BA	— Background colour.	DAT	— Data 1.
TX	— Text colour.	L	— Used for general loops.
MC	— Start address for Machine code.	T	— Used for loops when L is busy.
SC	— Used to blank the screen.	IN$	— Current character from keyboard.
FS	— File size.	PV	— Contains POKE value used by the input routine.
R$	— Code for return key.	CC	— Holds number of LEFT$ for CD$.
ID$	— Code for delete key.	IL	— Input length.
SP$	— Code for space bar.	K	— Relates KY$ to KEY$.
EP$	— Code for left arrow key (used as escape).	LN	— Field (line) number.
CL$	— Code for clr key.	IR$	— Accumulates IN$.
KY$	— (1-5) Strings used for KEY$	RI$	— Returns the 'real' input from IR$.
CD$	— Contains 24 cursor down characters.	FP	— First record to print.
		LP	— Last record to print.
		V	— Used to hold VAL of a string.
		ST	— File status (system variable).

```
10 REM ************************************
20 REM ** (C)J.A.WOLFE    APRIL 1985    **
30 REM ************************************
40 REM ************************************
50 REM **           INITIALISE          **
60 REM ************************************
70 BO=53280:BA=53281:TX=646:MC=49152:SC=53265:FS=250
80 R$=CHR$(13):ID$=CHR$(20):SP$=CHR$(32)
90 ES$=CHR$(95):CL$=CHR$(147)
100 KY$(1)="1234567890."+R$+ID$
110 KY$(2)="&ABCDEFGHIJKLMNOPQRSTUVWXYZ"+KY$(1)+R$+ID$+SP$
120 KY$(3)="1234567"
130 KY$(4)="1234567890"+R$+ID$+ES$
140 KY$(5)="1234567890"+R$+ID$+ES$+CHR$(94)
150 FORL=1TO24:CD$=CD$+CHR$(17):NEXT
160 FORL=1TO40:UL$=UL$+CHR$(163):NEXT
170 DIML1$(FS)
180 DIML2$(FS)
190 DIML3$(FS)
200 DIML4$(FS)
210 DIML5$(FS)
220 DIML6$(FS)
230 DIMIN$(35)
240 FORL=1TOFS
250 LETL1$(L)="*"
260 NEXT
270 L=0
280 READDAT
290 IFDAT=-1THEN320
300 POKEMC+L,DAT
310 L=L+1:GOTO280
320 POKE785,MC-INT(MC/256)*256
330 POKE786,INT(MC/256)
340 REM ************************************
350 REM **          MENU SCREEN           **
360 REM ************************************
370 POKESC,11:POKEBA,11:POKEBO,11:PRINTCL$;:POKETX,3:GOSUB2930
380 PRINTTAB(16)"[DOWN][s U][s C][s C][s C][s C][s I]":POKETX,12
390 PRINTTAB(16)"[s B][RVSON]MENU[RVSOFF][s B]":POKETX,3
400 PRINTTAB(16)"[s J][s C][s C][s C][s C][s K]"
410 PRINTTAB(11)"[DOWN][[c 5]1[CYAN]][c 5] ADD REC'DS":POKETX,3
420 PRINTTAB(11)"[[c 5]2[CYAN]][c 5] DELETE REC'DS":POKETX,3
430 PRINTTAB(11)"[[c 5]3[CYAN]][c 5] LIST REC'DS":POKETX,3
440 PRINTTAB(11)"[[c 5]4[CYAN]][c 5] PRINT REC'DS":POKETX,3
450 PRINTTAB(11)"[[c 5]5[CYAN]][c 5] SAVE FILE":POKETX,3
460 PRINTTAB(11)"[[c 5]6[CYAN]][c 5] LOAD FILE":POKETX,3
470 PRINTTAB(11)"[[c 5]7[CYAN]][c 5] EXIT TO O/S":POKETX,3
480 PRINTTAB(17)"[DOWN][> ]"
490 POKESC,PEEK(SC)OR16
500 KEY$=KY$(3):POKE198,0
510 IN$=CHR$(USR(0))
520 POKETX,12:PRINTTAB(19)"[UP]";IN$
530 IN=VAL(IN$)
540 ONINGOSUB560,970,1230,1390,2170,2460,2710
550 GOTO340
560 REM ************************************
570 REM **           ADD REC'DS           **
580 REM ************************************
590 FORL=1TOFS:IFL1$(L)="*"THEN640
600 NEXTL
610 POKETX,3:PRINTTAB(9)"NO RECORDS AVAILABLE"
620 POKETX,15:PRINTTAB(9)LEFT$(UL$,20)
630 FORL=0TO2000:NEXT:RETURN
640 RF=FS-L+1:FF=L
650 POKESC,11:PRINTCL$;
660 POKETX,15:PRINTTAB(14)"[s U][s C][s C][s C][s C][s C][s C][s C][s C][s
C][s I]"
670 POKETX,13:PRINTTAB(14)"[s B]ADD REC'DS[s B]"
680 POKETX,15:PRINTTAB(14)"[s J][s C][s C][s C][s C][s C][s C][s C][s C][s
C][s K]"
690 PRINT"[s U][s C][s C][s C][s I]";TAB(34)"[s U][s C][s C][s C][s I]"
700 POKETX,13:PRINTRF;TAB(5)"RECORDS FREE";TAB(24)"RECORD NO-";FF
710 POKETX,15:PRINT"[s J][s C][s C][s C][s K]";TAB(34)"[s J][s C][s C][s C][s K]
"
720 PRINTLEFT$(CD$,2);
```

```
730 FORL=1TO6
740 PRINT"LINE";L
750 PRINTTAB(7)LEFT$(UL$,30)
760 NEXT
770 POKESC,PEEK(SC)OR16
780 PV=55623:CC=8:IL=30:K=2:LN=1
790 PRINT"[HOME]";LEFT$(CD$,CC);
800 PRINTTAB(6)">";
810 GOSUB3110
820 IFLN=1THENLETL1$(FF)=RI$:IFL1$(FF)=""THENLETL1$(FF)="*"
830 IFLN=2THENLETL2$(FF)=RI$
840 IFLN=3THENLETL3$(FF)=RI$
850 IFLN=4THENLETL4$(FF)=RI$
860 IFLN=5THENLETL5$(FF)=RI$
870 IFLN=6THENLETL6$(FF)=RI$
880 PV=PV+80:CC=CC+2:LN=LN+1
890 IFLN>6THEN910
900 GOTO790
910 POKETX,3:PRINTR$;"[DOWN][DOWN]'F' FOR FURTHER ADDITIONS '_' TO ESCAPE
920 KEY$="F"+ES$:POKE198,0
930 IN$=CHR$(USR(0))
940 IFIN$=ES$THENRETURN
950 IFIN$="F"THEN590
960 END
970 REM *******************************
980 REM **       DELETE REC'DS       **
990 REM *******************************
1000 POKESC,11:PRINTCL$;
1010 POKETX,15:PRINTTAB(12)"[s U][s C][s C][s C][s C][s C][s C][s C][s C][s C][s
 C][s C][s C][s C][s I]":POKETX,13
1020 PRINTTAB(12)"[s B]DELETE REC'DS[s B]":POKETX,15
1030 PRINTTAB(12)"[s J][s C][s C][s C][s C][s C][s C][s C][s C][s C][s C][s C][s
 C][s C][s K]"
1040 POKETX,13:PRINTTAB(1)"[DOWN]ENTER RECORD NUMBER FOLLOWED BY RETURN"
1050 POKETX,15:PRINTTAB(1)LEFT$(UL$,38)
1060 POKETX,13:PRINTTAB(11)"USE '_' TO ESCAPE"
1070 POKETX,15:PRINTTAB(11)LEFT$(UL$,17)
1080 POKESC,PEEK(SC)OR16
1090 PV=55617:CC=8:IL=3:K=4
1100 PRINT"[HOME]";LEFT$(CD$,CC);
1110 POKETX,15:PRINTTAB(1)">";
1120 GOSUB3110
1130 IFRI$=ES$THENPRINTES$:GOSUB3360:RETURN
1140 V=VAL(RI$)
1150 IFV>FSORV<1THENFORT=1TOLEN(RI$):PRINTID$;:NEXT::GOTO1100
1160 POKETX,3:PRINTTAB(10);L1$(V);:POKETX,15
1170 POKETX,13:LETKEY$="YN":PRINTR$;" CONFIRM?[Y/N]"
1180 IN$=CHR$(USR(0))
1190 IFIN$="N"THEN1210
1200 LETL1$(V)="*"
1210 K=4:PV=PV+80:CC=CC+2:IFCC>22THENFORL=0TO2000:NEXT:GOTO970
1220 GOTO1100
1230 REM *******************************
1240 REM **       LIST FILE           **
1250 REM *******************************
1260 L=1:KEY$="C"+ES$
1270 PRINTCL$;
1280 POKETX,13:PRINT"REC'D #";TAB(9)"[CYAN]ADDRESEE ('*'=EMPTY RECORD)"
1290 POKETX,15:PRINTLEFT$(UL$,7);SPC(2);LEFT$(UL$,8);SPC(1);LEFT$(UL$,18)
1300 FORL=LTOL+19
1310 PRINTTAB(1)"[c 6]";L;TAB(9)"[CYAN]";L1$(L)
1320 IFL=FSTHENL=1:GOTO1340
1330 NEXTL
1340 POKETX,15:PRINTTAB(5)"[DOWN]'C' TO CONTINUE '_' TO ESCAPE"
1350 POKE198,0
1360 IN$=CHR$(USR(0))
1370 IFIN$=ES$THENRETURN
1380 IFIN$="C"THEN1270
1390 REM *******************************
1400 REM **       PRINT FILE          **
1410 REM *******************************
1420 POKESC,11:PRINTCL$;
1430 POKETX,15:PRINTTAB(14)"[s U][s C][s C][s C][s C][s C][s C][s C][s C][s C][s
 C][s I]"
1440 POKETX,13:PRINTTAB(14)"[s B]PRINT FILE[s B]"
```

```
1450 POKETX,15:PRINTTAB(14)"[s J][s C][s C][s C][s C][s C][s C][s C][s C][s C][s
 C][s K]"
1460 POKETX,13:PRINTTAB(3)"[DOWN]USE '^' TO REFERENCE FILE LISTING"
1470 POKETX,15:PRINTTAB(3)LEFT$(UL$,33)
1480 POKETX,13:PRINTTAB(14)"'_' TO ESCAPE"
1490 POKETX,15:PRINTTAB(14)LEFT$(UL$,13):REM POKETX,3
1500 PRINTTAB(8)"[DOWN]PRINT FROM REC'D NUMBER-"
1510 PRINTTAB(18)"[DOWN][DOWN]";LEFT$(UL$,3)
1520 PRINTTAB(12)"[DOWN]TO REC'D NUMBER-"
1530 PRINTTAB(18)"[DOWN][DOWN]";LEFT$(UL$,3)
1540 CC=11:IL=3:K=5:PV=55753:P=1
1550 PRINT"[HOME]";LEFT$(CD$,CC);TAB(17)">";
1560 POKESC,PEEK(SC)OR16:GOSUB3110
1570 IFRI$=CHR$(94)THENGOSUB1230:GOTO1390
1580 IFRI$=ES$THENRETURN
1590 V=VAL(RI$)
1600 IFV>FSORV<1THENFORT=1TOLEN(RI$):PRINTID$;:NEXT:GOTO1550
1610 IFP=1THENLETFP=V
1620 IFP=2THENLETLP=V:GOTO1650
1630 CC=CC+5:PV=PV+240:IL=3:K=5:P=P+1
1640 GOTO1550
1650 IFLP<FPTHEN1390
1660 POKESC,11:PRINTCL$;:POKETX,12:KEY$="R"+ES$
1670 PRINT"-------------------------------------"
1680 PRINT"[s C][s C][s C][s C][s C]  [c M][s W] [s B]       [s B] [s W][c G]
1690 PRINT"[s C][s C][s C][s C][s C]  [c M][s W] [s J][s C][s C][s C][s C][s C][
s C][s K] [s W][c G] [c 7]FEED PINS[c 5]"
1700 PRINT"[s C][s C][s C][s C][s C]  [c M][s W] [s U][s C][s C][s C][s C][s C][
s C][s I] [s W][c G][s N][c 7](COVERS CLOSED)[c 5]"
1710 PRINT"[s C][s C][s C][s C][s C]  [c A][s C][c S][s B]       [s B][c A][s C][
c 8]
1720 PRINT"[s C][s C][s C][s C][s C]  [s B][s Q][s B][s B]       [s B][s B][s Q][
s B]
1730 PRINT"[s C][s C][s C][s C][s C] [RVSON][s D][RVSOFF][s B][s Q][c Q][s J][s
C][s C][s C][s C][s C][s C][s K][c W][s Q][s B][RVSON][s D][s D][s D][s D][s D][
s D][s D][s D][s D][s D][s D]"
1740 PRINT"[s C][s C][s C][s C][s C]  [s B][s Q][s B][s U][s C][s C][s C][s C][s
 C][s C][s I][s B][s Q][s B]
1750 PRINT"[s C][s C][s C][s C][s C]  [c Z][s C][c X][s B]       [s B][c Z][s C][
c X]
1760 PRINT"[s C][s C][s C][s C][s C]  [c M][s W] [s B]       [s B] [s W][c G]
1770 PRINT"[s C][s C][s C][s C][s C]  [c M][s W] [s J][s C][s C][s C][s C][s C][
s C][s K] [s W][c G]
1780 PRINT"[s C][s C][s C][s C][s C]  [c M][s W] [s N][s M][s C][s C][s C][s C][
s C][s I] [s W][c G]
1790 PRINT"-[s B]---------[c G][c M]----[s M]-----------------"
1800 PRINT" [s B]          [s N]      [c 7]FIRST LABEL[c 5]"
1810 PRINT" [s B][c 7]PRINT HEAD[c 5]"
1820 PRINT" [s B]              "
1830 PRINT" [c 7]LEFT SIDE
1840 PRINT" OF PRINTER
1850 POKETX,15:PRINTTAB(16)"IMPORTANT"
1860 POKETX,3:PRINTTAB(6)"SET PRINTER UP AS ILLUSTRATED."
1870 PRINTTAB(6)"CONNECT NECESSARY LEADS AND"
1880 PRINTTAB(6)"ENSURE THAT POWER IS ON."
1890 PRINTTAB(6)"[DOWN]'R' WHEN READY '_' TO ESCAPE":POKESC,PEEK(SC)OR16
1900 POKE198,0:IN$=CHR$(USR(0))
1910 IFIN$=ES$THENRETURN
1920 OPEN4,4:PRINTCL$;:POKE198,0
1930 L=FP-1:R=0
1940 L=L+1:IFL=LP+1THENCLOSE4:RETURN
1950 IFL1$(L)="*"THEN1940
1960 PRINTL1$(L)
1970 PRINT#4,L1$(L)
1980 PRINTL2$(L)
1990 PRINT#4,L2$(L)
2000 PRINTL3$(L)
2010 PRINT#4,L3$(L)
2020 PRINTL4$(L)
2030 PRINT#4,L4$(L)
2040 PRINTL5$(L)
2050 PRINT#4,L5$(L)
2060 PRINTL6$(L)
2070 PRINT#4,L6$(L)
```

```
2080 PRINTR$:PRINT#4,R$,R$
2090 POKETX,15:PRINT"PRESS SPACE BAR TO PAUSE":POKETX,3:PRINTR$
2100 IFPEEK(198)<>0THEN2120
2110 GOTO1940
2120 KEY$="C"+ES$:POKE198,0
2130 POKETX,15:PRINT"[UP]'C' TO CONTINUE '_' TO ESCAPE[DOWN]"
2140 IN$=CHR$(USR(0))
2150 IFIN$=ES$THENCLOSE4:RETURN
2160 POKE198,0:POKETX,3:GOTO1940
2170 REM ******************************
2180 REM **         SAVE FILE        **
2190 REM ******************************
2200 KEY$="R"+ES$:POKESC,11:POKETX,15:PRINTCL$:L=0:GOSUB2990
2210 POKETX,12:PRINT"[HOME]";LEFT$(CD$,5);TAB(15)"SAVE FILE";LEFT$(CD$,5):POKETX
,3
2220 PRINTTAB(10)"1) INSERT FILE TAPE."
2230 PRINTTAB(10)"[DOWN]2) REWIND TO START."
2240 PRINTTAB(10)"[DOWN]3) 'R' WHEN READY"
2250 PRINTTAB(13)"('_' TO ESCAPE).":POKESC,PEEK(SC)OR16
2260 POKE198,0:IN$=CHR$(USR(0))
2270 IFIN$=ES$THENRETURN
2280 PRINTTAB(10)"[DOWN]4) PRESS RECORD & PLAY.":POKETX,11
2290 OPEN1,1,2,"FILE 64"
2300 POKESC,11:PRINTCL$;"[HOME]":POKETX,3:GOSUB2930
2310 PRINTLEFT$(CD$,2):POKETX,15:GOSUB2990
2320 L=L+1:IFL=FS+1THENCLOSE1:GOTO2420
2330 LETL1$=L1$(L)
2340 LETL2$=L2$(L)
2350 LETL3$=L3$(L)
2360 LETL4$=L4$(L)
2370 LETL5$=L5$(L)
2380 LETL6$=L6$(L)
2390 PRINT#1,L1$;R$;L2$;R$;L3$;R$;L4$;R$;L5$;R$;L6$;R$
2400 IFL1$(L)="*"THENCLOSE1:GOTO2420
2410 GOTO2320
2420 IFST=0THENRETURN
2430 POKESC,PEEK(SC)OR16:POKETX,3:PRINTLEFT$(CD$,2)TAB(11)"FILE STATUS ERROR"
2440 POKETX,15:PRINTTAB(11)LEFT$(UL$,17)
2450 FORL=0TO2000:NEXT:GOTO2200
2460 REM ******************************
2470 REM **         LOAD FILE        **
2480 REM ******************************
2490 KEY$="R"+ES$:POKESC,11:POKETX,15:PRINTCL$:L=0:GOSUB2990
2500 POKETX,12:PRINT"[HOME]";LEFT$(CD$,5);TAB(15)"LOAD FILE";LEFT$(CD$,5):POKETX
,3
2510 PRINTTAB(10)"1) INSERT FILE TAPE."
2520 PRINTTAB(10)"[DOWN]2) REWIND TO START."
2530 PRINTTAB(10)"[DOWN]3) 'R' WHEN READY"
2540 PRINTTAB(13)"('_' TO ESCAPE).":POKESC,PEEK(SC)OR16
2550 POKE198,0:IN$=CHR$(USR(0))
2560 IFIN$=ES$THENRETURN
2570 PRINTTAB(10)"[DOWN]4) PRESS PLAY ON TAPE.":POKETX,11
2580 OPEN1,1,0,"FILE 64"
2590 POKESC,11:PRINTCL$;LEFT$(CD$,3):POKETX,3:GOSUB2930
2600 PRINTLEFT$(CD$,2):POKETX,15:GOSUB2990
2610 L=L+1:IFL=FS+1THENCLOSE1:RETURN
2620 INPUT#1,L1$,L2$,L3$,L4$,L5$,L6$
2630 IFL1$="*"THENCLOSE1:RETURN
2640 LETL1$(L)=L1$
2650 LETL2$(L)=L2$
2660 LETL3$(L)=L3$
2670 LETL4$(L)=L4$
2680 LETL5$(L)=L5$
2690 LETL6$(L)=L6$
2700 GOTO2610
2710 REM ******************************
2720 REM **      RETURN TO O/S       **
2730 REM ******************************
2740 LETKEY$="YN"
2750 POKETX,3:PRINTTAB(11)"[DOWN]ARE YOU SURE (Y/N)
2760 POKETX,15:PRINTTAB(11);LEFT$(UL$,18)
2770 IN$=CHR$(USR(0))
2780 IFIN$="N"THENRETURN
2790 IFIN$="Y"THENSYS64738+28
```

```
2800 REM ********************************
2810 REM **        KEYVAL' DATA        **
2820 REM ********************************,165,252,197,48,208,6,165,251
2830 DATA 165,45,133,251,165,46,133,252,165,252,197,48,208,6,165,251
2840 DATA 197,47,240,51,160,0,177,251,41,128,240,15,24,165,251,105
2850 DATA 7,133,251,165,252,105,0,133,252,144,221,200,177,251,170,41
2860 DATA 128,240,233,138,201,197,208,228,136,177,251,201,75,208,221,200
2870 DATA 200,177,251,201,0,208,5,169,0,168,240,31,133,253,200,177
2880 DATA 251,72,200,177,251,133,252,104,133,251,32,228,255,240,251,164
2890 DATA 253,136,48,246,209,251,208,249,168,169,0,108,5,0,0,162,-1
2900 REM ********************************
2910 REM **          GRAPHIC           **
2920 REM ********************************
2930 PRINTTAB(12)"[s U][s C][c W] [s B][s U][s C][c R][c R][s C][s I]":POKETX,12
2940 PRINTTAB(12)"[s J][s I][s J][c R][s K][s J][s I][s B][c Q][s C] [s N][s M][
s N][s M]":POKETX,3
2950 PRINTTAB(11)"[s J][s C][s K] [s B][s J][s C][s K][s B][c Z][s C][s N]   [s
N]":POKETX,12
2960 PRINTTAB(14)"SIXTY FOUR":POKETX,3
2970 PRINTTAB(14)"[c T][c T][c Y][c Y][c U][c U][c Y][c Y][c T][c T]"
2980 RETURN
2990 REM ********************************
3000 REM **          GRAPHIC           **
3010 REM ********************************
3020 PRINTTAB(13)"[s U][s C][s C][s C][s C][s C][s C][s C][s C][s C][s C][s
I]"
3030 PRINTTAB(13)"[s B][s N][c Y][c Y][c Y][c Y][c Y][c Y][c Y][c Y][s M][s
B]"
3040 PRINTTAB(13)"[s B][c H] [s U][s I][c A][s C][c S][s U][s I] [c N][s B]"
3050 PRINTTAB(13)"[s B][c H] [s J][s K][c Z][s C][c X][s J][s K] [c N][s B]"
3060 PRINTTAB(13)"[s B][c H]             [c N][s B]"
3070 PRINTTAB(13)"[s B][c Y][c Y][c Y][c Y][c Y][c Y][c Y][c Y][c Y][c Y][s
B]"
3080 PRINTTAB(13)"[s B] [s U][s C][s C][s C][s C][s C][s C][s I] [s B]"
3090 PRINTTAB(13)"[c Z][s C][c E][s C][s C][s C][s C][s C][s C][c E][s C][c
X]"
3100 RETURN
3110 REM ********************************
3120 REM **        INPUT ROUTINE       **
3130 REM ********************************
3140 FORL=1TO30:IN$(L)="":NEXT
3150 L=1:KEY$=KY$(K):IR$="":RI$=""
3160 PRINT"*[LEFT]";:IN$(L)=CHR$(USR(0))
3170 IFIN$(L)=R$THENIN$(L)="":GOTO3290
3180 IFIN$(L)=ID$THEN3250
3190 IFIN$(L)=ES$THENRI$=ES$:RETURN
3200 IFIN$(L)=CHR$(94)THENRI$=CHR$(94):RETURN
3210 PRINTIN$(L);
3220 L=L+1
3230 IFL=IL+1THEN3290
3240 GOTO3160
3250 IFL=1THEN3160
3260 PRINTIN$(L);:LETIN$(L)=""
3270 L=L-1
3280 GOTO3160
3290 PRINT" ";:FORL=1TOIL+1:RI$=RI$+IN$(L)
3300 NEXTL
3310 FORL=PVTOPV+IL:POKEL,3:NEXT
3320 RETURN
3330 REM ********************************
3340 REM **      SHUFFLE ROUTINE       **
3350 REM ********************************
3360 PRINT"[HOME]";CD$;TAB(39);:FORL=1TO680:PRINTID$;:NEXT
3370 POKETX,3:PRINT"[HOME]";LEFT$(CD$,10);TAB(6)"[DOWN]SORTING RECORDS,PLEASE WA
IT"
3380 POKETX,15:PRINTTAB(6)LEFT$(UL$,27)
3390 L=0:T=0
3400 L=L+1:IFL=FS+1THENRETURN
3410 IFL1$(L)="*"THEN3430
3420 GOTO3400
3430 LETT=L
3440 T=T+1:IFT=FS+1THENRETURN
3450 IFL1$(T)="*"THEN3440
3460 LETL1$(L)=L1$(T):LETL1$(T)="*"
3470 GOTO3400
```

TOP 20

Compiled by *Gallup*

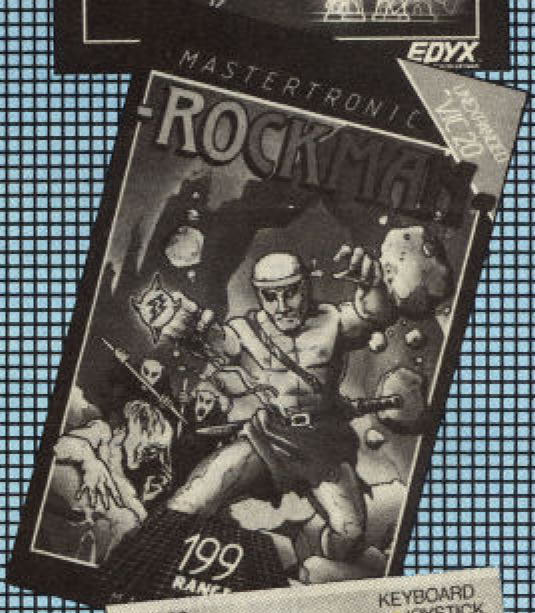
Software

COMMODORE 64

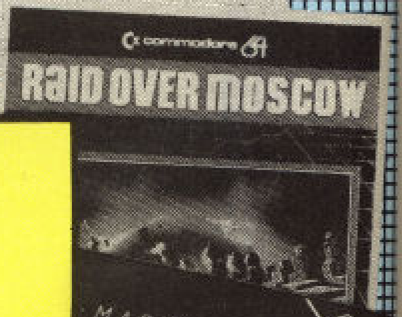
TITLE	PUBLISHER
1 Soft Aid	Various
2 International Basket Ball	Commodore
3 Dambusters	US Gold
4 Pitstop II	CBS
5 Cauldron	Palace Software
6 World Series Baseball	Imagine
7 Entombed	Ultimate
8 Impossible Mission	CBS
9 Theatre Europe	PSS
10 Airwolf	Elite
11 Everyone's a Wally	Mikrogen
12 Shadowfire	Beyond
13 Pole Position	Atari
14 Moon Cresta	Incentive
15 Bruce Lee	US Gold
16 Big Mac	
17 Kikstart	Mastertronic
18 Rocket Ball	IJK
19 Spitfire 40	Mirrorsoft
20 Raid Over Moscow	US Gold

Retail sales for the week ending May 27th 1985











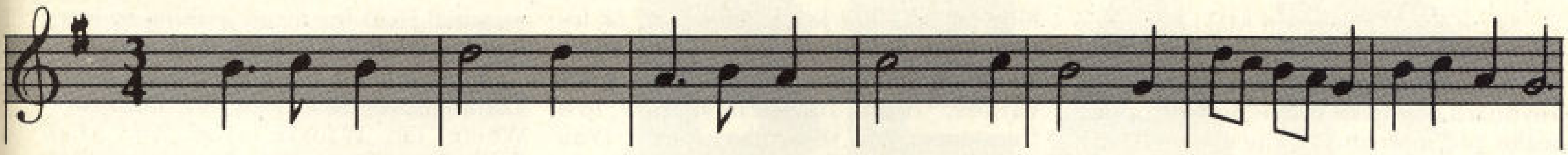
VIC 20

Top Ten

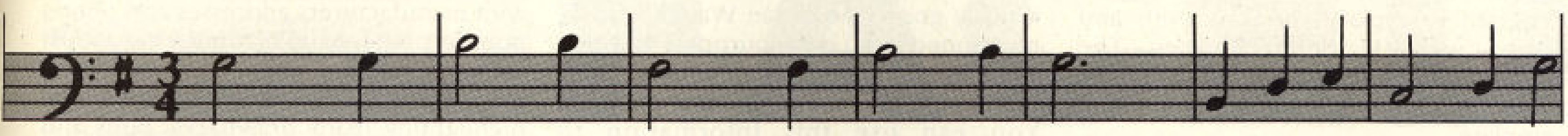
TITLE	PUBLISHER
1 RIP The Game	Mastertronic
2 Hunchback	Ocean
3 Rockman	Mastertronic
4 Micky the Bricky	Firebird
5 Doodlebug	Mastertronic
6 Psycho Shopper	Mastertronic
7 Catcha Snatcha	Imagine
8 Football Manager	Addictive Games
9 Vegas Jackpot	Mastertronic
10 Bewitched	Imagine

Retail sales for the month ended May 27th 1985

Compiled by Gallup for the industry's weekly trade magazine, Computer and Software Retailing. For details contact John Ross, Computer and Software Retailing, 222 Regent Street, London W1R 3AB. 01-434 2131.



THE WELL-TEMPERED 64



Phil South closes his music series with a few bells & whistles.

The Last Chorus

WELL HERE WE ARE. THE LAST EPISODE of this scintillating survey of simplified synthesis on the sixty-four! We've been through almost everything, all that remains is to tie up some loose ends and go out with a bang! (Cut the verbosity and get on with it, South! - - Ed.) Ok! Ok!, by the way, sorry if this all seems a little muddled; trying to explain about computer music in a four part series is like wrestling with a hot-buttered octopus.

Is it real, or is it...synthesised?

Last month we promised you some tips on Imitative Synthesis. Well, unfortunately we ran out of space, so to begin this last sortie into music and synthesis, here is the info:

Imitative synthesis is the art (or in some cases science) of imitating natural sounds or conventional instruments. This is a controversial topic, as synths can imitate ANY instrument, with intelligent programming, and you try telling that to the Musicians Union; they'd smash your face in! Synthesisers, and Computer keyboards generally, are seen to be doing for the number of working musicians what the advent of computers did to the number of working accountants. Personally I don't think musicians have anything to worry about; NOTHING sounds as good as a real instrument played well by a real person. But I digress.

Here, for your use, are some hints and tips on how to imitate all your favourite instruments.

PIANO: The most difficult sound to imitate, mainly because of the complexity of the instrument; all that vibrating wood and metal! Still, try a pulse wave with an attack/decay of about 9, and sustain/release of 0. POKE the lo-byte pulse width address with 255. Alternatively, use a triangle wave with fast attack, slow decay, no sustain, and a little release.

HARPSICHORD: Nice one this! Almost the same as piano, but slightly less decay and release, to give it that sharp, plucky sound. Use a sawtooth wave, too!

VIOLIN: Octave range between 4 and 6. Sawtooth wave with slow attack, slow decay and lots of sustain. Lots of glide and vibrato effects, too!

SAX: Tricky! Tenor is in the octave range 2 to 4. Alto in the range 3 to 5. Try a pulse wave and trim the width to taste. Medium to fast attack, medium decay, lots of sustain and medium release. Use glide to slide UP to the notes.

XYLOPHONE: Triangle wave, with a fast attack and slow decay/release. No sustain. Octave 4 to 7.

TRUMPET: Fast attack and no decay. Sawtooth wave in the octave 4 to 6. Trilling and vibrato goes well here.

SNARE DRUM: Noise wave. Fast attack, medium decay. Use drum rolls.

BASS DRUM: Pulse wave on a very low octave. Same ADSR as Snare.

So there you have it; just a random sampling to give you a head start. If these sounds don't seem quite right to you, then fiddle with them. No, hold on there, I don't mean get yer bow out, I mean the start tinkering or feeling out the sound. The only way you can really learn to do this is if you can get immediate feedback as you alter the sound. You need a good synth package. This brings me neatly round to talk about the amazing MusiCalc.

The Business

There is no two ways about it. I've seen pretty much every synth package for the 64 that there is, but this beats them ALL! Hands down. No messing about.

MusiCalc is a system, not just a program, but a suite of programs. They are being constantly updated and enhanced by the US writers. Waveform, and their UK distributor. (01-241-2448)

The basic system is the MusiCalc 1 disk. This is the original program, and contains the synthesiser and sequencer parts of the system. The program presents you with control panel, much the same as you would find on a real lsynth (What am I saying, this is a real synth!), unlike such a lot of other synth programs, which use two or three separate screens and confusing abbreviations for different functions, MusiCalc crams all the information onto one screen by tasteful use of graphics (see screen shots): the little dashes under the letters tspn and gsrt are switches, and the black lines are faders. The grid is your sequencer display, showing a measure of sixteen beats, in fifteen rows.

The top row of faders control the ADSR, or attack, decay, sustain, release, for the 3 oscillators, and are colour coded to the cursors on the sequencer grid. The next row down control the pulse width. The row below that holds the faders for the filter and modulation. Finally, the bottom row displays the coarse, medium and fine tempo controls, giving the user a very wide range of tempos to select from.

The score, the manner in which notes are input into the sequencer, is a little strange to use at first, but you soon get used to it. It is actually quite logical, and the tutorial program soon has you tapping away with gay abandon. The lay of the land, with respect to scoring each voice, is competantly illustrated by the sample tunes, which when you first boot up the disk are automatically loaded into the preset SOUND and SCORE locations.

MusiCalc 2: "Scorewriter" is the second disc in the system. On it are three programs which extend the already formidable facilities of the system: the Scorewriter program itself, List Maker and E. Sequencer.

Scorewriter takes your SCORE files created by MusiCalc 1, and turns them into music, sheet music that can be read by any competant musician. This is great, because if you, like me have no idea about "sticks and blobs" notation, then this means that you really don't have to; the program does it all for you. List Maker and E.Sequencer form a major improvement in the way MusiCalc plays back it's SCORES, by allowing you to chain them together to make long and complicated tunes, otherwise impossible in the 15×16 matrix.

MusiCalc 3: Keyboard Maker extends the possibility still further, by letting you set up, or load from a library of eighty, keyboard scales, to utilise non-European scales and intonations. The choice is very varied, from Japanese, Indonesian, Balinese, Baroque and Indian.

MusiCalc's range of creative possibilities is further extended by the use of musical "templates", loaded into the program to replace the 32 sounds and scores with 32 different ones. The African/Latin template is certainly very impressive, as is the Rock/New Wave template.

The MusiCalc system is the current best on the market, and as a MusiCalc representative said to me, "at the price, it should be!" What is the price? A cool £45 for MusiCalc 1, £30 each for 2 and 3, and £15 for each of the music templates! But even THAT doesn't put me off. It's worth every penny: no 64 owner should be without it!

I thought MIDI was a kind of skirt

The fact that the extensive (I said extensive not expensive!) MusiCalc system can utilise MIDI brings me to the next subject, and one very much the rage at the moment. MIDI, or Musical Instrument Digital Interface, allows any synth with MIDI to be linked and used with any other make or synth carrying the system. The upshot of this is that you can for instance, use a MIDI guitar synth to drive a drumbox or a keyboard to drive a guitar etc. Confusing.

If you want to know all about MIDI and a good deal more besides then I must refer you to Mark Jenkins' excellent book, "Electronic Music on the Commodore 64" published by Sunshine Books. In it he covers all aspects of computer music, with special reference to the 64. He also gives a list of all the relevant MIDI codes.

Speaking to the machine

Machine code isn't a hard thing to learn, and it can be invaluable to the music programmer. Especially if you want to write music for a computer game. One thing you learn about when you learn machine code is the significance of 16 bit numbers.

A Commodore 64 can only deal with 8 bits at a time. Due to those bits being in binary the highest 8 bit number you can get is 255. So when you have to input a number like 440, the frequency of the note A above middle C, you're up the creek. So you have to split the number into two 8 bit ones, the most significant, or hi-byte, and the least significant, or lo-byte. That, my dear friend is the reason for all those annoying numbers for pitch values, high frequency and low frequency. You remember Frekk? (You don't? Shame on you! Buy a back issue, immediately!) Well, that's what it was doing.

Another thing you'd learn by checking out memory maps of the SID chip (there's a really good one in Ian Waugh's book, mentioned later) is the purposes to which you can put oscillator 3. At address 54299 (S+27) you can read the output of Osc 3. You can use this information to "modulate" either of the other voices. The digital (numbers) output from this Oscillator could be made to make the note wobble or trill, using the figures output from this source to increment the pitch or filter. (Think of it as a bit of homework, Jones Minor.) POKEing address 54296 with 128 turns the output of Osc. 3 off, so you just hear the effect. Try it out.

Interface the music

One of the most joyous things your average 64 owner discovers sooner or later is how very easy the 64 is to interface with the outside world. Via the video/audio socket in the back of your 64, you can link it to your hi-fi for example. Pin 3 does the job. That is the one on the right of the five holes in your 5-pin DIN socket. In this manner, you could record the musical output from your compueter, OR you could put it through a musical effects pedal, like a chorus or flanger. This will give the sound more body, and generally fatten it up for recording. (Or indeed just listening to!)

The well tempered bookshelf

The only way to get swotted up on what to do in all the things I've mentioned is to get a good book on the one you're most interested in. Due to considerations of space I haven't been able to go into the topic in any mega-depth, but there are books around which can do this. So, now I present the Flippo Good Music Book Guide:

Ian Waugh "Commodore 64 Music" (Sunshine Books) — This is a book about the 64's musical capacity in great depth and readability. Mr Waugh treats the subject with clarity and covers all aspects of making music with your computer. The memory maps of the SID chip are particularly useful to the aspiring programmer, as are the exhaustive explanations as to what does what. An essential read for those wishing to learn how to use the 64's musical talent.

Mark Jenkins "Electronic Music on the Commodore 64" (Sunshine Books) — Where Ian Waugh leaves off, Mark Jenkins takes up, and covers the rocky ground thereafter. Interfacing and detailed MIDID info is here, as well as comprehensive lists of all the best music software and hardware available, along with manufacturers addresses and phone numbers. Mr Jenkins obviously has a lot of technical ability, and he shares it all with the reader in very clear language, highlighting many drawbacks, hints and tips which one can only ever normally gain with experience. A very informative and stimulating book, and well worth the seven quid.

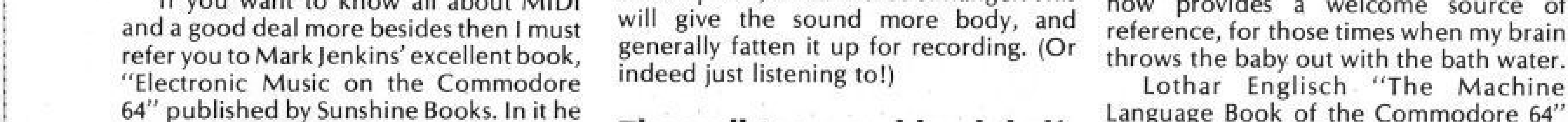
George Martin "Making Music" (Pan Books) — The producer of the Beatles edits articles by everyone who's ever done anything in music on their specialist topic; Bernard Krause on electronic music, Hans Zimmer on synthesisers, Herbie Hancock on playing synthesisers and Warren Cann on computer music, plus many, many more. As far as I'm concerned, this is the set text as far as recording and the technical aspects of music are concerned. It's also a flippin' good read!

Danny Davis "Machine Language for the Absolute Beginner" (Melbourne House) — Logically written and illuminating. I found, as a person with an incomplete knowledge of machine code, (I learn only what I need to, to solve a particular problem) that it filled in the necessary gaps in my knowledge, and now provides a welcome source of reference, for those times when my brain throws the baby out with the bath water.

Lothar Englisch "The Machine Language Book of the Commodore 64" (Abacus/Adamsoft) — translated from German, I think, because the English is a little stiff. Nevertheless a book packed with content. Ok, so the cover and typesetting wouldn't win any prizes, but then we aren't here to judge design. Not so good as a reference book, and more for the serious student, perhaps.

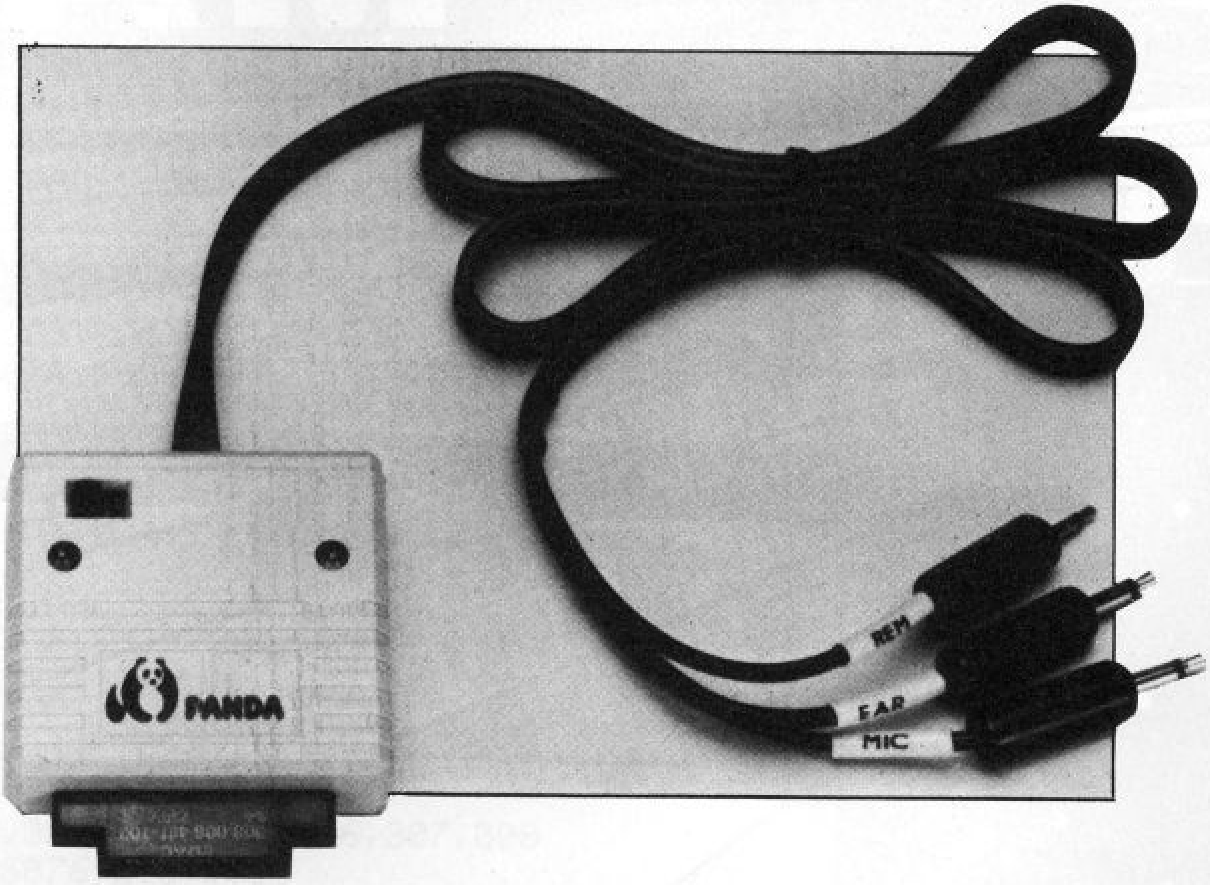
CODA

So, that, my fine lads and lasses, is all you need to know to make music with your computer. Simple innit? I hope you've enjoyed this series. If you have any queries about the series (that rhymes!) then please do not hesitate to write to me, Phil South, c/o Your Commodore, Argus Specialist Press, No. 1 Golden Square, LONDON, W1R 3AB.



BEAR FACED

With Pact International Ltd's Panda cassette interface, it is now possible to use a normal domestic cassette recorder with the 64 or VIC 20. Does this mean death to the datasette? Mike Roberts passes judgement.



EVERYBODY EVEN SLIGHTLY INVOLVED with Commodore computers knows about the famous (or infamous) Commodore tape system.

Back in the old days, the commodore PET (at around £700) was the ultimate in home computers. It had a built-in screen and a built-in tape deck. At that stage nobody was arguing about the tape system because interfacing normal tape recorders was a pretty hit or miss affair.

Later, PETs came with an external tape deck because the space on the front panel was needed to fit in a real keyboard. Some grumbles were heard from the computer fraternity at this stage, but nobody raised any serious objections due to maintaining compatability with earlier models.

Then came the VIC and the Commodore 64. Commodore were universally siammed for their unwillingness to provide a 'normal' tape system using a domestic tape recorder. But there are some good reasons for having a dedicated unit. If unturboed, it is the most reliable and user friendly (who will ever forget 'PRESS PLAY ON TAPE 1' system ever devised. It compares favourably with other dedicated tape systems. Atari is unreliable and unfriendly, so is the Amstrad system - which isn't really a dedicated system at all but just a standard Amstrad device plugged in for marketings sake.

The big problem is price, whereas most people have a cassette recorder nowadays, most don't have the £45 necessary to buy a C2N or 1531.

Looking at the output of the tape connector it doesn't seem too difficult to plug in a normal cassette as long as you connect it correctly. Alas, this is not so. Speech, music, and normal computer tape interfaces have their sound waves composed of sine waves or the like - great for music and speech, but not so good for transmitting computer information, which is, after all, a series of ons and offs and not analogue at all.

The Commodore tape interface uses a series of square waves to transmit its information (much more sensible for computer data); this results in a square wave. Domestic cassette recorders hate square waves, some even have circuitry to turn them into sine waves, not what we want at all.

Cassette interface

This brings us to the problem again of a cheap system for Commodore users. What we want is a cheap black box that plugs into the 64 or VIC and lets you use a domestic cassette recorder.

The 'Panda' cassette interface claims to solve the problem. Pack in utilitarian bubble packaging it is neither cheap or black, but the 'blurb' does say that it will load all tapes 'including turbos'. Turbos are another problem for Commodore users as some normal Commodore tape decks will not even accept them, the frequencies are just too high.

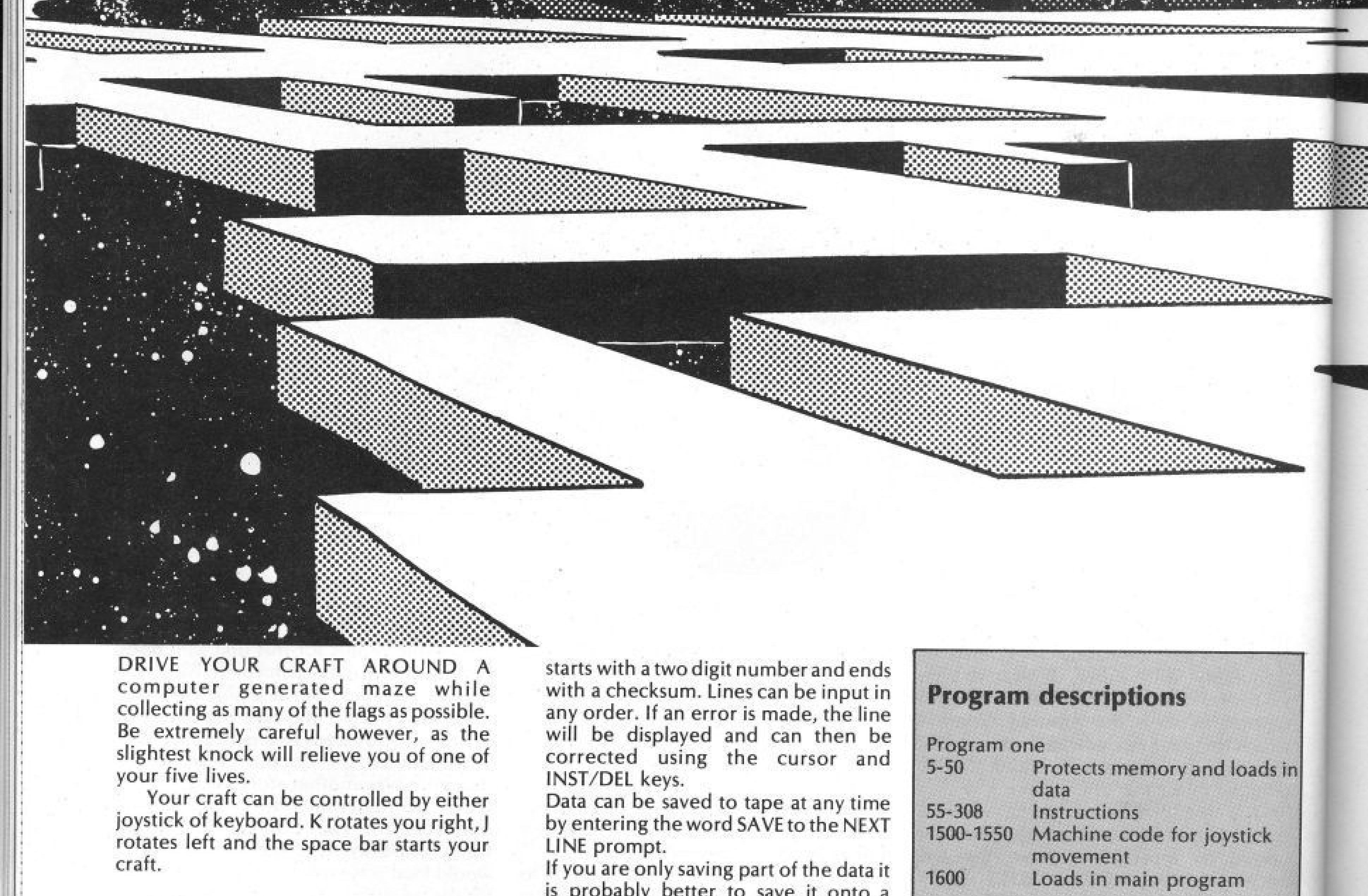
The Panda interface is equipped with a special switch which is designed to alter the signal level and increase reliability. There are also two lights on top which indicate whether a LOAD or a SAVE is in operation. On opposite sides of the main box is the edge connector and the three wires that go to your standard tape deck.

Unfortunately, I cannot give a favourable report for this unit as it does not function as is claimed. It will load normal 64 tapes, and it is slightly more reliable with tapes that have been written by it than with tapes written by a normal Commodore tape system. With Turbos though it was another story altogether. I tried six different tape decks, two interfaces and two Commodore 64s as well as one CBM 3032. The only turbo that would load is Novaload, which says more for the reliability of the Turbo than for the interface because Novaload is notoriously reliable, and will load into almost everything.

My verdict is that at £19.95 this device is far to expensive a gamble to take. You have to gamble that your tape deck will work with it, your computer will work with it, and that every piece of software that you ever buy with it will work - which is very unlikely, and remember most shops will refuse to swap software if it will work on their system. Surely £45 for a datasette isn't too much for piece of mind?

DEATH MAZE

Hampton Court was never as dangerous as this program from Paul Randall for the unexpanded VIC 20.



DRIVE YOUR CRAFT AROUND A computer generated maze while collecting as many of the flags as possible. Be extremely careful however, as the slightest knock will relieve you of one of your five lives.

Your craft can be controlled by either joystick of keyboard. K rotates you right, J rotates left and the space bar starts your craft.

Entering the Program

Death Maze must be typed into your VIC 20 in three parts; this is due to the large amount of machine code and character data.

Four simple steps must be followed in entering the program these are as follows:

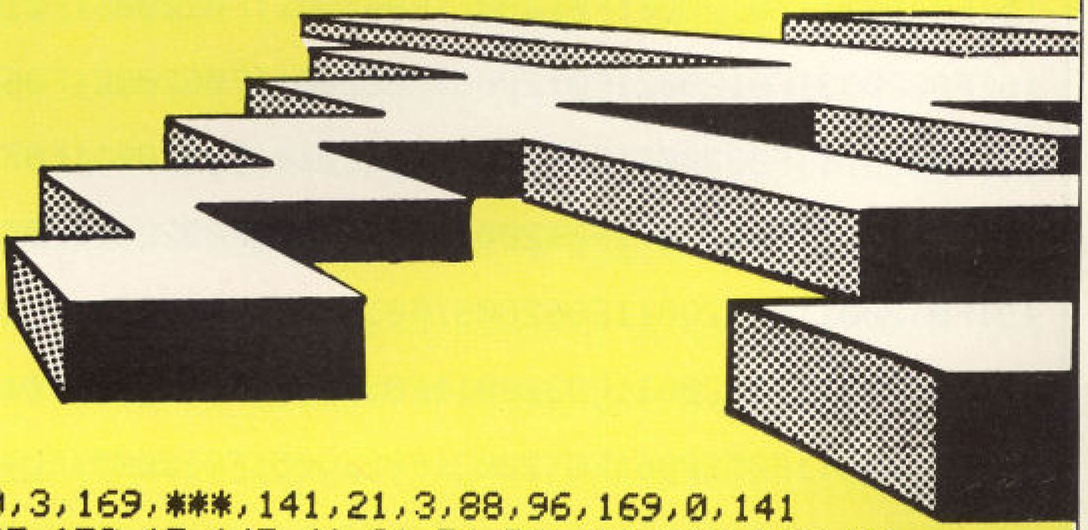
1 Enter Program 1 and save on tape
2 Enter the machine code loader and save on a separate tape
3 Using the loader program type in the hex values exactly as printed. Each line starts with a two digit number and ends with a checksum. Lines can be input in any order. If an error is made, the line will be displayed and can then be corrected using the cursor and INST/DEL keys.
Data can be saved to tape at any time by entering the word SAVE to the NEXT LINE prompt.
If you are only saving part of the data it is probably better to save it onto a spare tape. Remember to LOAD it back into the machine by typing LOAD when presented with the NEXT LINE prompt.
It is possible that if you have made any corrections to the data that line 00 will have been corrupted it is therefore advisable that you type this line in last.
When all of the data has been typed in SAVE it onto the tape straight after Program one using the SAVE option as before.
4 Enter the main program and save after the machine code and program one.

Program descriptions

Program one	
5-50	Protects memory and loads in data
55-308	Instructions
1500-1550	Machine code for joystick movement
1600	Loads in main program
Program two	
	Machine code Hex values
Program three	
4-40	Set up variables (M is the number of craft.)
55-65	Sets up screen
120-180	Main movement routines
200-210	Crash routine
230-248	Game over routine
303-340	Finished level
400-414	Title screen
900-990	Set screen

Program Listing 1

```
5 POKE52,22:POKE56,22
10 POKE780,2:POKE781,1:POKE782,1:SYS65466
15 POKE780,0:SYS65469
18 PRINT"ɔ        LOADING
20 POKE780,0:POKE781,18:POKE782,22:SYS65493
50 POKE36879,234:POKE36869,255
55 PRINT"ɔ■■        DEATH MAZE        "
57 PRINT"■ SPORT OF THE FUTURE!"
59 PRINT"■   GUIDE YOUR CRAFT "
61 PRINT"■  AROUND EACH SECTOR"
63 PRINT"■   COLLECTING FLAGS"
65 PRINT"■AND AVOIDING BARRIERS."
67 PRINT"PRESS FIRE OR SPACE TO■          START. "
70 FORJ=1TO9
72 PRINT"■■■■■■■■■■■■■■■■■■■■"TAB(J+5)"#";
74 FORK=1TO100:NEXTK
75 ONJGOSUB300,301,302,303,304,305,306,307,308
76 POKE36878,J+5:POKE36876,255-J*10
79 NEXTJ:POKE36878,0
85 GETA$:IFA$=""THEN85
90 PRINT"ɔ■■        DEATH MAZE        ■"
95 PRINT"  THE CRAFT THRUSTS "
97 PRINT"■        FORWARD."
100 PRINT"■  ROTATE RIGHT-HIT K"
102 PRINT"■  ROTATE LEFT-HIT J"
104 PRINT"■  OR USE A JOYSTICK"
106 FORJ=1TO9
108 PRINT"■■■■■■■■■■■■■■■■■■■■■"TAB(J+5)"#";
110 FORK=1TO100:NEXTK
112 ONJGOSUB300,301,302,303,304,305,306,307,308
114 POKE36878,J+5:POKE36876,255-J*10
116 NEXTJ:POKE36878,0
118 GETA$:IFA$=""THEN118
119 POKE36876,0
120 GOTO1500
300 PRINT"■H":RETURN
301 PRINT"■I":RETURN
302 PRINT"■T":RETURN
303 PRINT"■ ":RETURN
304 PRINT"■A":RETURN
305 PRINT"■ ":RETURN
306 PRINT"■K":RETURN
307 PRINT"■E":RETURN
308 PRINT"■Y":RETURN
```



```
1500 DATA120,169,0,141,20,3,169,***,141,21,3,88,96,169,0,141
1510 DATA19,145,141,34,145,173,17,145,41,31,74,74,133,144,173,17
1520 DATA145,41,32,74,5,144,133,144,173,32,145,41,128,74,74,74
1525 DATA74,5,144,73,31,133,144,169,255,141,34,145,76,191,234,234
1530 T=0:S=673
1540 FORI=0TO63
1545 READA$:IFA$="***"THENPOKES+I,(S+13)/256:POKES+I-5,(S+13)AND255:NEXT
1550 POKEI+S,VAL(A$):T=T+VAL(A$):NEXT
1600 POKE198,0:PRINT"ɔ";:POKE198,2:POKE631,19:POKE632,13J
```

Program Listing 2

```
          MACHINE CODE DATA
00C4A90085008502A91E8501A91B8503A0FFB102F02BAA88C0FFD002C603B10288* 384
01C0FFD002C6038404A0009100E60048A500C900D002E60168CAD0EFA4041890D1* 346
02A501C99630016 0A9968501A9008500881890BEA91BA046A20086008602A21E86* 335
03018503D0ACA919A0F9D0ECA918A0CCD0E6E01FF006A600E0F230402070172000* 373
0414A900CCCCECED01000B0100010A0106010C0103010101001 6010D0001010600* 205
050201010004010100020102000201010001010100040101000201060006010100* 45
060101060002010100040101000101060001010100040101000301050001010100* 47
070601010001010400040101000201010002010500060101000601020006010100* 57
080101060002011100020101000201010011010200020114000301010007010100* 48
090701010001010100030107000101070001010100010101000301010005010300* 52
100501010001010100010101000A01080001010100010101000301080006010100* 58
110101010001010100020101000301010003010300040101000101010001010100* 34
120201010003010100050106000101030002010500030105000401010019012C00* 74
1316005301 1D012B013B012B0187012001 1F16200D1F0120061F0220011F042001* 200
141F0220021F0220011F0120011F0420011F0220061F0620011F0120061F022001* 183
151F0420011F0120061F0120011F0420011F0220061F0120011F0620011F012004* 185
161F0220031F0120021F0120061F0620011F0620021F0620011F0120061F022011* 192
171F0220011F0220011F1120021F0220141F0320011F0720011F0720011F012001* 183
181F0320071F0120071F0120011F0120011F0320011F0520031F0520011F012001* 186
191F0120011F0320011F0620081F0120011F0120011F0220091F0620011F012001* 188
201F0120011F0220011F0320011F0320031F0420011F0120011F0120011F022001* 171
211F0320011F0520061F0120031F0220051F0320051F0420011F19204201000B01* 194
2200010A0106010C010301010106160109060 1010A06020114060201050606 0109* 129
230602010C06110105060201050603010C0602010306050 10C06020103060501 03* 134
24060101080 60A01030601011006020103060101100602010306010110060201 14* 101
25060201140602010106120101060201140602010906010 10A060F01070602 0109* 132
260601010A0617012C0616005301 1D012B013B012B0187012001 1F1620091F0120* 199
```

Program Listing 2 (cont.)

```
270A1F0220141F0220051F0620091F02200C1F0F20071F0120061F03200C1F0120* 242
28041F0120011F03200C1F0120041F0120011F0320031F0120081F0620011F0320* 197
29031F0120101F0220031F0120101F0220031F0120101F0220141F0220141F0220* 179
30011F1220011F0220141F0220091F01200A1F0220091F0120011F0220071F0220* 202
31091F01200A1F1720425F000B0100200A0106010C0103010101041601140402 01* 165
32140402010404010 10B04030101040201030402010404030108040201140403 01* 99
330E040701020407010604010104040201 0F04010104040201140402010204 0101* 115
34050401010B04050105040101 0B040201020401010504010 10B0402011404 0201* 110
3514040C01060401010304020101040101070403010404010103040201010402 01* 94
360D0401010304020114041701 2C04160053011D012B013B012B018701 20011F16* 181
3720141F0220141F0220041F01200B1F0320011F0220031F0220041F0320081F02* 202
3820141F02200F1F0120041F02200F1F0120041F02200F1F0120041F0220141F02* 224
3920021F0120051F01200B1F0220021F0120051F01200B1F0220021F0120051F01* 197
40200B1F0220141F0220141F0220101F0120031F0220011F0120071F0320041F01* 195
4120031F0220011F02200D1F0120031F0220141F17204201000B0100010A010601* 170
420C01030101010216011402020114020201140202011402020114020201140202* 88
4301140202011402020114020201140202011402020114020201140202011402 02* 80
44011402020114020201140202011402 17012C02160053011D012B013B012B0187* 152
450120011F1620141F0220141F0220141F0220141F0220141F0220141F0220141F* 200
460220141F0220141F0220141F0220141F0220141F0220141F0220141F0220141F* 200
470220141F0220141F0220141F1720421C224A564C201E001824427E424242007C* 245
4822223C22227C001C22404040221C00782422222222478007E40407840407E007E* 244
4940407840404001C22404E42221C004242427E424242001C08080808081C000E* 234
50040404044438004244487048444200404040404 07E0042665A5A42424200 42* 211
5162524A464242001824424242 2418007C42427C404040001824424 24A241A007C* 238
5242427C484442003C42403C02423C003E0808080808080042424242423C0042* 242
53424224241818004242425A5A66420042422418244242002222221C080808007E* 223
5402041820407E003C2020202020 3C000C10103C10706E003C04040404043C0000* 189
```

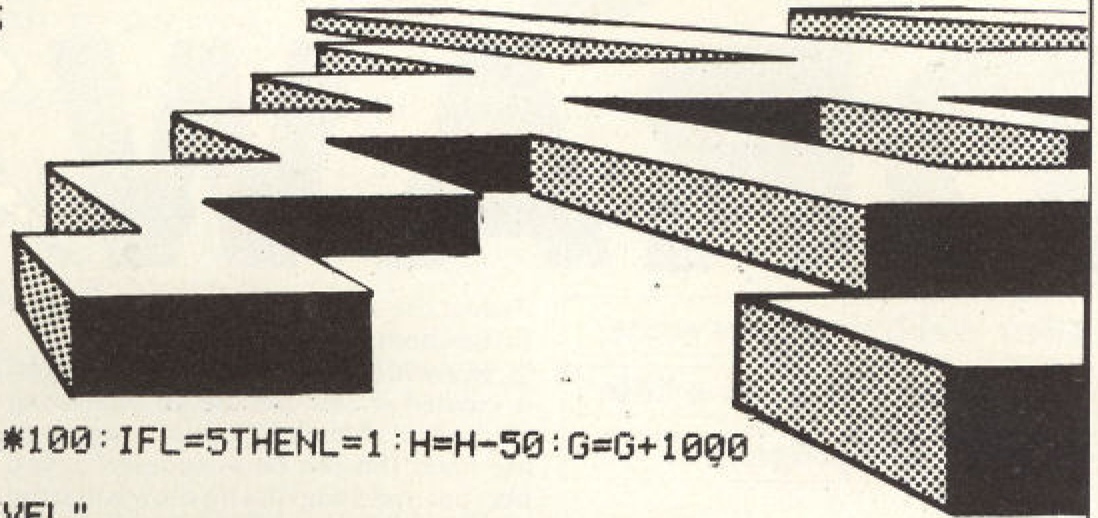
Program Listing 2 (cont.)

```
55081C2A08080808FFFFFFFFFFFFFFFF0000000000000000011B3EECEC3E1B0118* 426
56183C667E3C66C380D87C37377CD880C3663C7E663C18180C1C3C1C0C04040430* 403
574848304A443A00040810000000000000408101010080400201008080810200008* 140
582A1C3E1C2A08000008083E08080000000000000000808100000007E0000000000* 162
5900000000181800000204081020400003C42465A62423C0008182808080083E003C* 197
6042020C30407E003C42021C02423C00040C14247E0404007E407804024438001C* 241
6120407C42423C007E42040810101000 3C42423C42423C003C42423E0204380000* 224
620000800000800000000080000080810 0E18306030180E0000007E007E00000070* 148
63180C060C18535041434520474 14D45* 126
```

Program Listing 3

```
4 N=36876
5 POKE52,22:POKE56,22:POKE51,17:POKE55,17
10 SYS673:POKEN+2,15:POKE36869,255:POKEN+3,158
30 DIMA(3),B(3),C%(4):A(0)=33:A(1)=34:A(2)=35:A(3)=36:C%(1)=5650:
C%(2)=5732:C%(3)=5750
40 C%(4)=5756:B(0)=-1:B(1)=-22:B(2)=1:B(3)=22:D=7955:M=5:L=1:GOSUB400
55 GOSUB900:GOSUB950
60 PRINT"▒■SCORE";G:PRINTTAB(14)"▒LIVES";M
65 PRINT"▒▒▒LEVEL";L:PRINTTAB(14)"▒FLAGS";F
120 C=PEEK(197)
125 IFI=0ANDST=16ORC=32THENI=1
135 IFST=4ORC=20THENE=E-1:IFE=-1THENE=3
140 IFST=8ORC=44THENE=E+1:IFE=4THENE=0
150 POKED,32:POKE30720+D,0:IFI=0THEN170
160 D=D+B(E)
162 IFPEEK(D)=31THENM=M-1:D=7955:I=0:GOSUB200:IFM=0THENGOTO230
164 IFPEEK(D)=37THENG=G+F*F:GOSUB220:F=F+1:IFF=9THENL=L+1:GOTO300
170 POKED,A(E):POKE30720+D,1
175 FORJ=1TOH:NEXT
180 GOTO60
200 FORJ=1TO10
202 POKEN+1,255-J*10
204 POKEN-12,11:POKEN-11,35:GOSUB500
208 POKEN-12,13:POKEN-11,41
210 NEXTJ:POKEN+1,0:POKEN-12,12:POKEN-11,38:RETURN
220 POKEN,255:FORJ=1TO10:NEXT:POKEN,0:RETURN
230 FORJ=1TO4:PRINT"▒▒▒▒▒▒▒▒▒▒▒
232 PRINTTAB(6)"■GAME OVER
234 POKEN,255:GOSUB500
236 PRINT"▒▒▒▒▒▒▒▒▒▒▒▒"
238 PRINTTAB(6)"▒■GAME OVER":POKEN,128
241 GOSUB500:NEXT:POKEN,0
```

Program Listing 3 (cont.)



```
244 POKE198,0:PRINTTAB(6)"▒HIT A KEY"
246 GETA$:IFA$=""THEN246
248 CLR:RUN
300 FORJ=1TO10
305 POKEN,128+J*10
307 FORJ1=1TO10:NEXTJ1
310 NEXTJ
315 FORJ=10TO1STEP-1
320 POKEN,255-J*10
323 FORJ1=1TO10:NEXTJ1
324 NEXTJ:POKEN,0
325 PRINTCHR$(19)
330 I=0:F=0:D=7955:G=G+L*100:IFL=5THENL=1:H=H-50:G=G+1000
340 GOTO55
400 PRINT"□      SKILL LEVEL"
405 PRINT"▒▒▒1▒-EXPERT"
407 PRINT"▒▒2▒-AVERAGE"
410 PRINT"▒▒3▒-NOVICE"
412 GETM$:IFM$<"1"ORM$>"3"THEN412
414 H=VAL(M$)*50:RETURN
500 FORQ=1TO100:NEXTQ:RETURN
900 SYSC%(L):POKE8185,31:POKE38905,0:RETURN
950 FORJ=1TO9:READK:POKEK,37:POKE30720+K,2:NEXT:RESTORE:RETURN
990 DATA7778,7788,7793,7890,7986,8016,8115,8131,8143
```

Machine Code Loader

```
5 HI=22:LO=17
10 P=HI*256+LO
20 PRINT"NEXT LINE":INPUTA$
30 IFA$="SAVE"THEN300
35 IFA$="LOAD"THEN200
40 IFA$="END"THENEND
50 T=VAL(LEFT$(A$,2)):C=0:E=0:J=3
60 M=ASC(MID$(A$,J,1)):N=ASC(MID$(A$,J+1,1)):J=J+2
63 IFM=42THEN100
65 IFN=42THEN110
70 GOSUB150:D=M*16:M=N:GOSUB150:D=D+M
80 POKEP+T*32+E,D:E=E+1:IFE<32THEN60
100 IFC=VAL(RIGHT$(A$,3))THEN20
110 PRINT"ERROR. RE-INPUT":PRINTA$;:INPUTA$:GOTO30
150 M=M-48:IFM>9THENM=M-7
160 C=C+M:RETURN
200 GOSUB205:GOTO220
205 PRINT"POSITION TAPE THEN":PRINT"PRESS A KEY"
207 GETA$:IFA$=""THEN207
208 POKE780,1:POKE781,1:POKE782,1:SYS65466
210 POKE780,2:POKE781,20:POKE782,1:POKE276,68:POKE277,77:SYS65469:RETURN
220 POKE780,0:SYS65493:GOTO20
300 GOSUB205:POKE251,LO:POKE252,HI:POKE780,251:POKE781,0:POKE782,30
:SYS65496:GOT 020
```

TOP DRAW



Allen Webb produces some more routines to add a little spice to your programs.

IN THE LAST PART OF THIS SERIES, I described how you could get interesting effects by manipulating redefined characters. This month, I want to cover some ways of producing some effects using fills and flashes. These effects are of value when you want to move from on display to another in an interesting way.

Most of you will have seen the screen effects used by some of the fast load programs available. The effect is to fill the screen, border or both with multicoloured stripes. By changing the delays, the width of the stripes can be altered. Loader 1 gives a simple routine which will give such an effect. Demo 1 shows what it can do. You can vary a number of parameters. Location 831 holds the delay parameter. This decides the width of the lines. (A value of 1 will give lines of about half a millimetre in width). You can specify the duration of the effect by putting the number of loops in location 829 and 830 (high byte in 830). Finally, location 832 holds a flag. A value of 1 limits the effect to the border, 2 flashes the screen and any other value flashes both.

In arcade type games, greater interest is created if you can use an interesting method of changing from one screen to the next. This can be as complex as you like, but one thing they do show is that the programmer has taken time to deal with the minor details. Loader 2 gives a trivial fill routine. This routine simply fills the screen with a specified character (in location 834) of a specified colour (in location 833). You can vary the speed from very slow to instantaneous by changing location 831.

A more interesting variant is given by loader 3. This is a random fill. The parameters available are character (location 902), number of loops (location 920), colour flag (location 921, 0 gives multicolour, 1 uses colour in location 922). The number of loops can be changed to give a part fill. A value of 44 will completely fill the screen, a lower value will not. A value above 44 will simply give a pretty effect. This sort of effect is used in Impossible Mission to signify that you have failed the complete the game. Using certain characters in this way can give some intriguing effects.

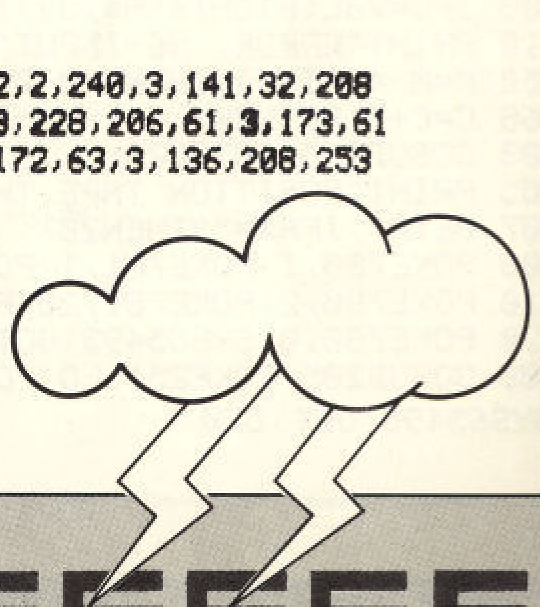
Loader 4 gives a move useful fill. This routine slowly fills an area of screen from top to bottom. To give smooth motion, the standard Commodore characters are used to fill in two pixels at a time. The effect is similar to a shutter slowly sliding down over a window. Got the idea? As usual, I've provided a number of tweakable parameters. The start line, top line is 1, is poked into 907. The end line plus 1 is poked into 908. Two delay parameters are put into 909 and 910. The value in 909 is a coarse tweak and 910 a fine adjustment. The colour of the fill goes into 906. Again, this sort of effect is used in Impossible Mission.

All of these routines occupy the spare area between the ROMs so no precautions are necessary to protect them from corruption. They occupy different ideas so that they can cohabit. The routines use common areas of zero page memory, but no conflict should occur.

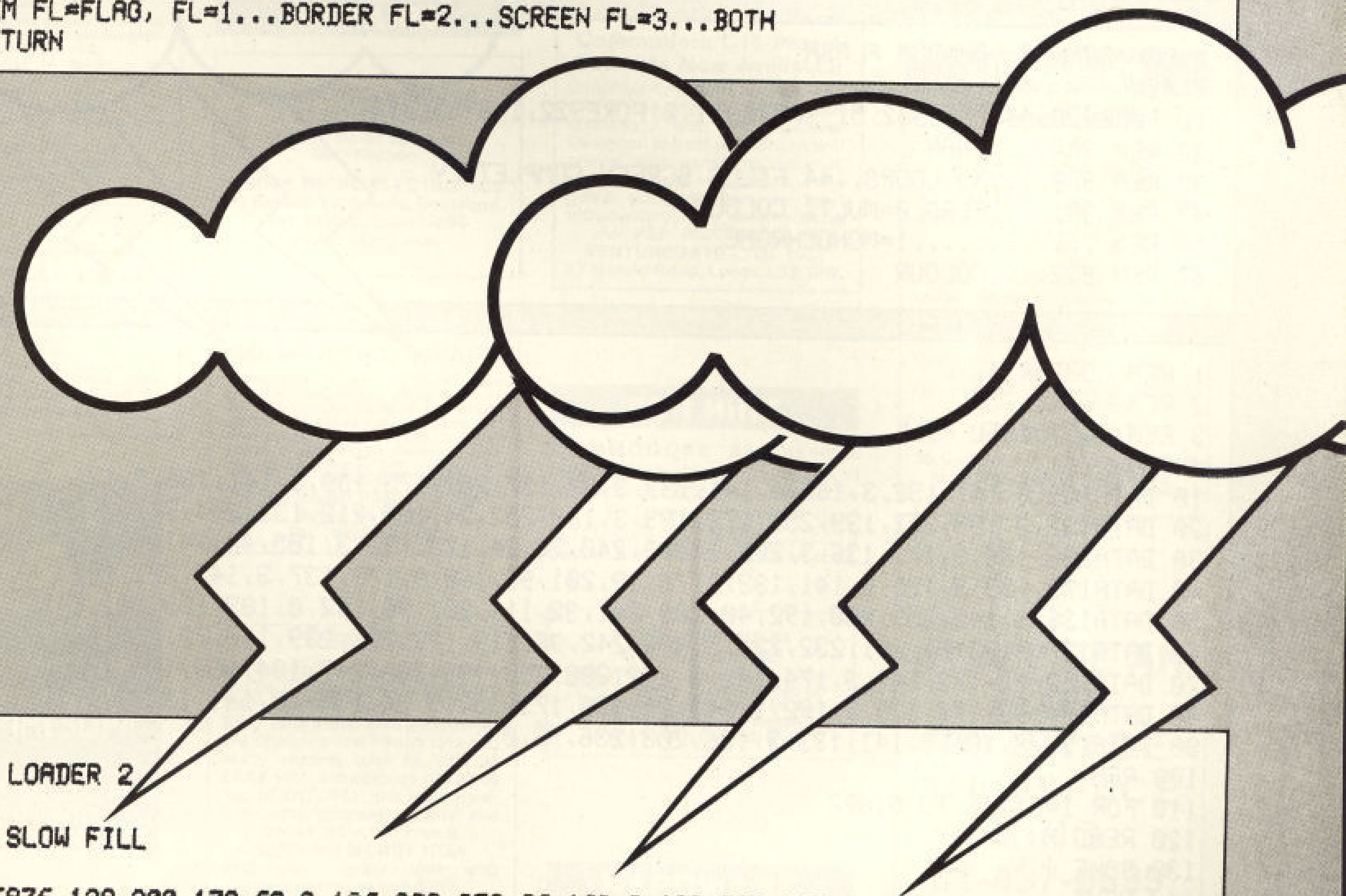
Clearly the range of effects available is huge, but when it comes down to it, they are based on similar concepts to those above. I've deliberately limited myself to simple routines for two reasons. First they are short meaning that they take up less RAM and they're easier for you to type in. Secondly, by allowing you to specify the operating parameters, complex effects are never-the-less possible.

Next month I will be applying myself to the problem of raster interrupts. Using my routine, you will have complete control over fifty zones on the screen allowing complex graphical effects.

```
0 REM LOADER 1
1 REM
2 REM FLASH ROUTINE
3 REM
10 DATA169,0,141,60,3,174,60,3,109,63,200,172,64,3,192,2,240,3,141,32,208
20 DATA192,1,240,3,141,33,208,32,56,200,232,224,16,208,228,206,61,3,173,61
30 DATA3,208,212,173,62,3,240,6,206,62,3,76,0,200,96,172,63,3,136,208,253
40 DATA96,2,3,4,5,6,7,8,9,0,13,14,10,6,7,8,9,13
50 REM
60 FOR I=51200 TO 51279
70 READ X: T=T+X
80 POKE I,X
90 NEXT
100 IF T<>7242 THEN PRINT"DATA ERROR"
```



```
1 REM DEMO 1   FLASH ROUTINE
5 REM
10 PRINTCHR$(147),CHR$(5)
20 NC=1000:DE=36:FL=3:GOSUB130
30 PRINT"WASN'T THAT APPALLING!"
40 PRINT:PRINT"WELL THINGS CAN BE NASTIER...HOW ABOUT  THIS...."
50 DE=1:NC=10000:GOSUB130
60 PRINT:PRINT"OR, IF THAT MAKES YOUR SYNAPSES TWITCH  THIS IS A LITTLE GENTLER"
70 NC=1000:DE=221:GOSUB130
80 PRINT:PRINT"YOU CAN TWEAK JUST THE BORDER..."
90 FL=1:NC=300:FOR DE=1TO80STEP5:GOSUB130:NEXT
100 PRINT:PRINT"OR JUST THE SCREEN...."
110 FL=2:NC=300:FOR DE=1TO80STEP5:GOSUB130:NEXT
120 END
130 POKE830,INT(NC/256):POKE829,NC-PEEK(830)*256:POKE832,FL
140 POKE831,DE: SYS51200
150 REM DE=DELAY 1...MIN, 255 MAX
160 REM NC=NO OF LOOPS
170 REM FL=FLAG, FL=1...BORDER FL=2...SCREEN FL=3...BOTH
180 RETURN
```



```
1 REM
2 REM LOADER 2
3 REM
4 REM SLOW FILL
5 REM
10 DATA76,138,200,172,63,3,136,208,253,96,169,0,133,251,169,4,133,252,169
20 DATA0,133,253,169,216,133,254,160,0,173,66,3,145,251,173,65,3,145,253,165
30 DATA251,24,105,1,133,251,165,252,105,0,133,252,165,253,24,105,1,133,253
40 DATA165,254,105,0,133,254,32,131,200,165,251,201,232,208,209,165,252,201
50 DATA7,208,203,96,0
60 REM
70 FOR I=51328TO51408
80 READX: T=T+X
90 POKEI,X
100 NEXT
110 IFT<>11563 THENPRINT"DATA ERROR"
```

```
1 REM LOADER 3
2 REM
3 REM RANDOM FILL
4 REM
10 DATA169,0,141,132,3,141,133,3,32,55,202,32,91,202,173,132,3,105,1,141,132
20 DATA3,173,133,3,105,0,141,133,3,205,152,3,208,232,96,24,160,41,162,5,152
30 DATA188,142,3,125,142,3,157,142,3,202,16,243,96,169,0,162,6,157,142,3,202
40 DATA16,250,96,173,142,3,133,251,133,253,173,143,3,41,3,9,4,133,252,24,105
50 DATA212,133,254,32,36,202,96,32,66,202,160,0,173,134,3,145,251,173,153
60 DATA3,240,6,173,154,3,76,117,202,173,144,3,41,15,145,253,96,0
70 REM
80 FOR I=51712TO51832
90 READ X: T=T+X
100 POKEI,X
110 NEXT
120 IFT<>13101 THEN PRINT"DATA ERROR"
```

```
1 REM DEMO 2  RANDOM FLASH
2 REM
10 POKE920,44:POKE902,51 :POKE921,0:POKE922,1:SYS51712
20 REM 902....CHAR
30 REM 920....NO LOOPS..44 FILLS SCREEN COMPLETELY
40 REM 921....FLAG 0=MULTI COLOUR
50 REM ............1=MONOCHROME
60 REM 922....COLOUR
```

```
1 REM LOADER 4
2 REM
3 REM TWO PIXEL FILL
4 REM
10 DATA169,0,141,132,3,169,4,141,133,3,32,137,201,173,139,3,141,136,3,173
20 DATA132,3,133,251,133,253,173,133,3,133,252,24,105,212,133,254,32,92,201
30 DATA238,136,3,173,136,3,205,140,3,240,20,24,173,132,3,105,40,141,132,3
40 DATA173,133,3,105,0,141,133,3,76,19,201,96,160,0,173,137,3,145,251,173
50 DATA138,3,145,253,200,192,40,208,241,32,114,201,96,162,0,189,109,201,141
60 DATA137,3,32,71,201,232,224,5,208,242,96,119,120,226,239,160,72,138,72
70 DATA152,72,172,141,3,174,142,3,202,208,253,136,208,247,104,168,104,170
80 DATA104,96,172,139,3,192,1,240,21,136,173,132,3,24,105,40,141,132,3,173
90 DATA133,3,105,0,141,133,3,136,208,236,96,0
100 REM
110 FOR I=51456 TO 51622
120 READ X: T=T+X
130 POKE I,X
140 NEXT
150 IF T<>20005 THEN PRINT"DATA ERROR"
```

```
1 REM DEMO 3  TWO PIXEL FILL
2 REM
10 POKE906,3: REM COLOUR
20 POKE 907,3 : REM START POSITION
30 POKE 908,24: REM END POSITION+1
40 POKE 909,40: REM OUTER DELAY LOOP
50 POKE910,40: REM INNER DELAY LOOP
60 SYS51456
```

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